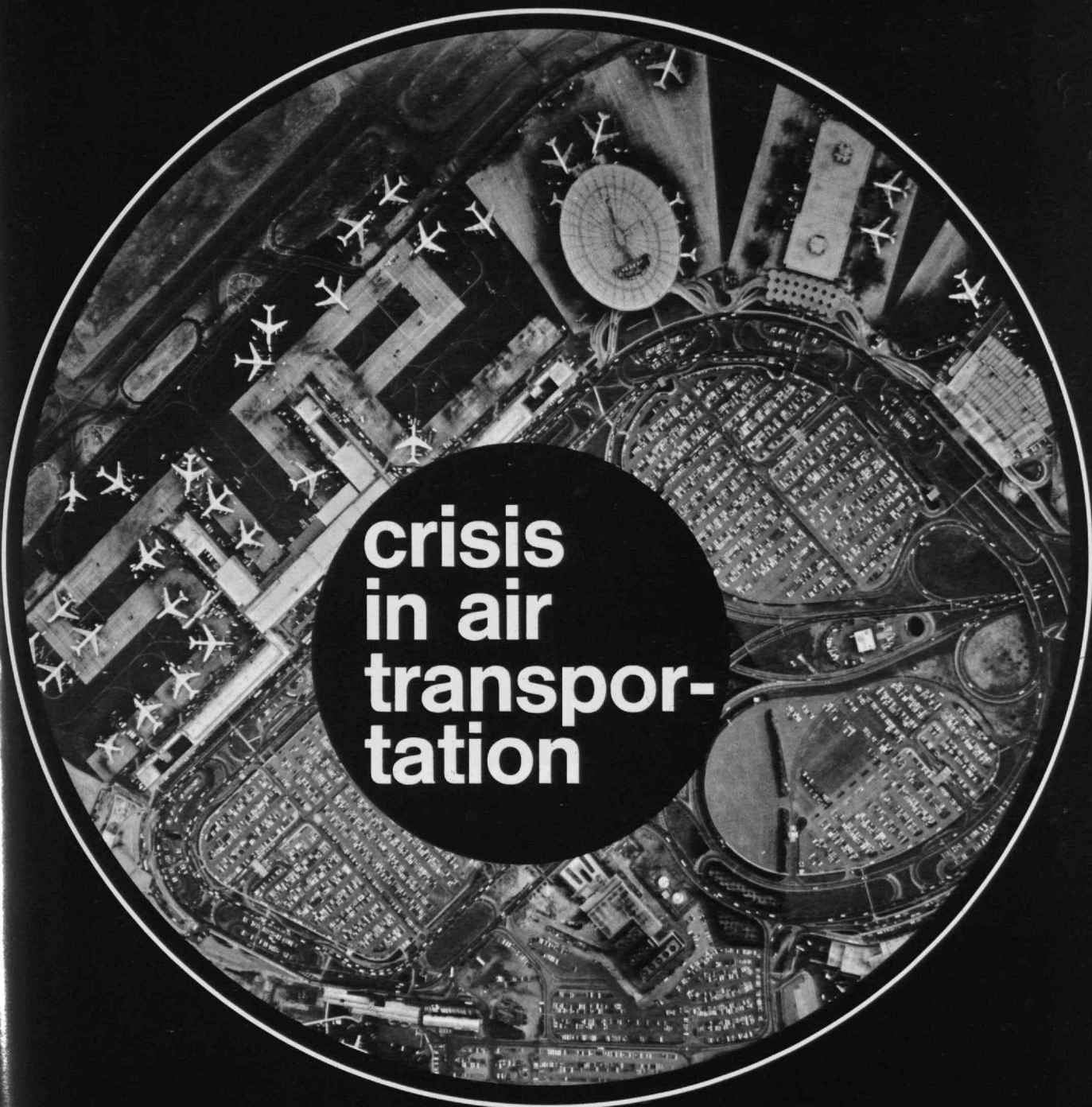


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New Men for Management



Technology Review

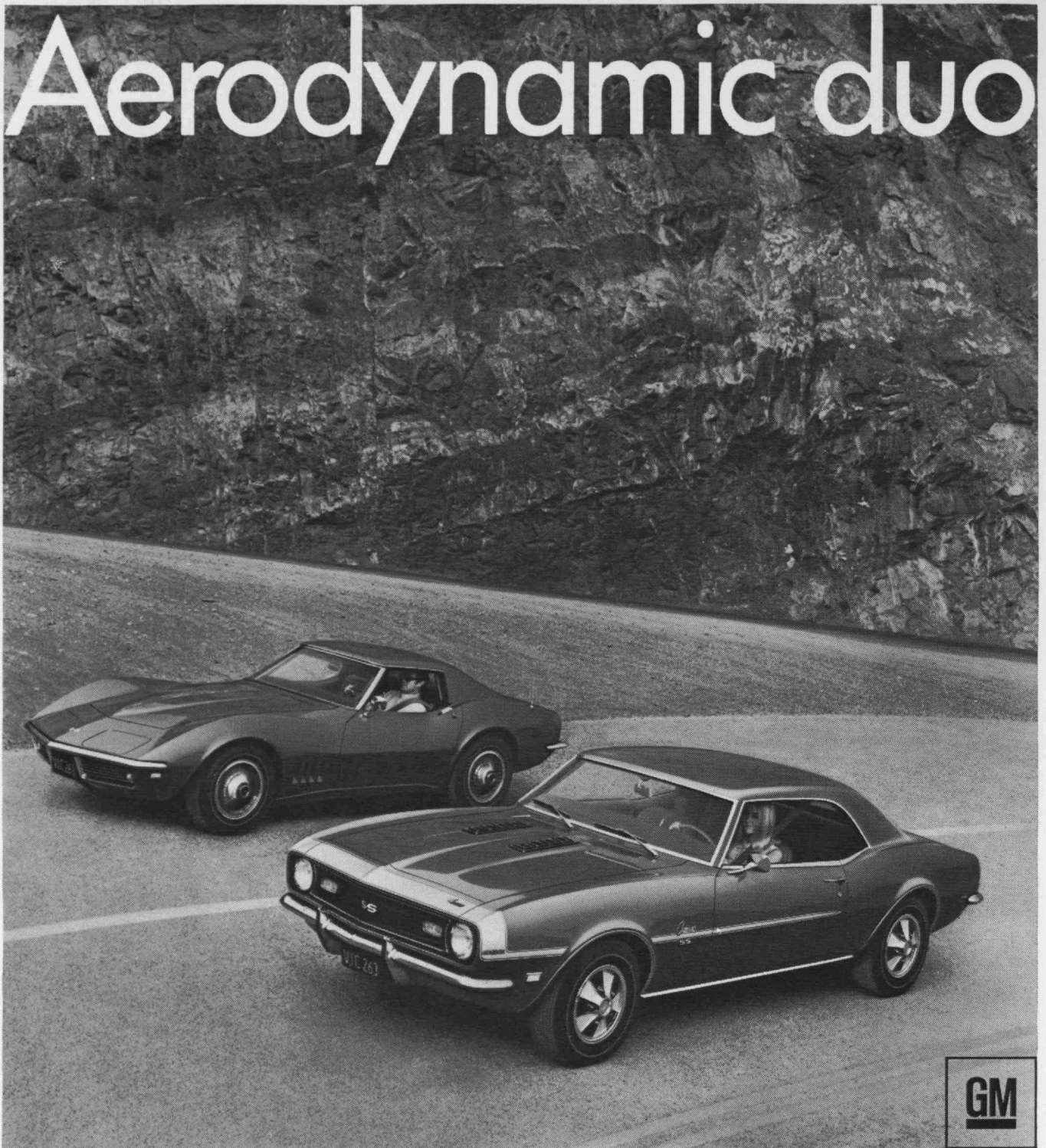


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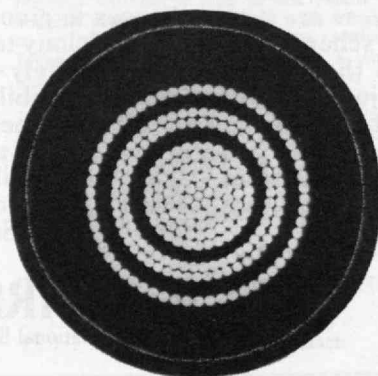
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Science Within a Devalued Economy

If, to the United States, a rising economic commitment in Vietnam, a pending tax increase and the coming November election add up to a budgetary squeeze that has creamed off half a billion dollars from N.A.S.A. and 10 per cent from the Department of Defense's research program, then American scientists can still count themselves lucky. Such things are fairly quickly absorbed, made up, and forgotten. If, in the meantime, a few large scientific and technological projects are suffering from a paucity of funds, so too are a number of scientific programs in Britain—but for other, more long-term reasons.

Overcoming the Malaise

Unlike most of the Continental European countries, Britain never really had a postwar 'economic miracle.' Without the peasant agricultural traditions of either France or Italy (the two countries which have profited most from being able to convert their spare agriculture labor forces, released as a result of increased farm mechanization, into industrial manpower), Britain has never had the same amounts of industrial slack which could be taken up to yield an impressive growth figure. And, although lucrative, the role of sterling as a reserve currency has proved a tiresome and restricting burden. Added to this has been heavy government spending on items such as the independent nuclear deterrent and its associated strike force, military forces in Europe, the Middle East and South-east Asia, the National Health Service, free education, old age benefits, and a somewhat unrealistic attempt to keep unemployment down to less than 0.5 per cent of the working population. These and other factors have all conspired to keep the U.K. tottering on an economic tightrope.

For a nation that has to import more than half of its basic food requirement, which has to be paid for with exports, lesson one in economic theory is: "Never let home market demand outstrip export performance." Always, this has been easier said than done, and successive Chancellors of the Exchequer have been forced to indulge in 'stop-go' policies to bring a burgeoning home market demand under control. By way of a change, the latest spanner to come

out of the Treasury toolbox—devaluation—is designed to produce an export-led expansion.

By dropping the value of the £ from \$2.80 to \$2.40 (making one penny conveniently equal to one cent), Britain is now selling goods in countries that have not devalued at prices which are in theory 14.3 per cent cheaper than they were a few months ago. However, coupled with this export incentive are vicious cuts in public expenditure to make sure that the home market does not boom again too quickly. In the next two years more than \$2 billion will be taken out of the public sector of the economy.

However, compared with the cuts in defense spending, the health, education and social service sectors have got off lightly. Thus while the Ministry of Defense has had to cancel the 50 F-111 aircraft on order from the United States (saving \$960 million), to arrange to pull out troops from the Far East and the Persian Gulf by 1971 and to phase out its aircraft carriers, the only sacrifices which have had to be made by the Department of Education and Science are the deferment of the raising of the school leaving age and the loss of the free milk supply for secondary schools (for ages 11 to 15 years plus). D.E.S.'s science vote has remained intact and so has that of the Ministry of Technology.

Even so, devaluation will have some effect in these two government departments. For one thing the cost of Britain's share of the Anglo/French *Concorde* supersonic jetliner will increase, and so will the U.K.'s contributions to the European Nuclear Research Organization (C.E.R.N.) in Geneva, the European Launcher Development Organization (E.L.D.O.) and the European Space Research Organization (E.S.R.O.) in Paris. Also, of course, Britain's contribution to the proposed (though still not agreed) European 300 BeV proton synchrotron has risen from \$90 million to nearly \$103 million as a direct result of devaluation. However, British physicists are still confident that they can meet this out of their own part of the science budget.

Tightening the Belt

Ironically, devaluation has had less of an impact on science than certain other policies formulated during times of relative plenty. Several years ago, for instance, the newly formed Council for Scientific Policy (C.S.P.)—the all-powerful 'umbrella' body which dictates policy for basic research in national laboratories—came in for heavy criticism for apparently "listening too sympathetically to tight-fisted Treasury officials." When the C.S.P. made its first report, in May, 1966, it pointed out that the capacity of the British economy would not permit the growth of government civil research (then about 13 per cent annually in real terms) within the limits of planned national expenditure.

The honeymoon was over; the science planners decided it was time to prune or be pruned. That year the basic science budget rose by only 12.2 per cent and in the following year growth slipped to 11 per cent. The next two years, 1968 and 1969, will see budgetary increases of 10 and 9 per cent, respectively, at which level it is then expected to flatten out. The C.S.P.'s recommendations, however, were only symptomatic of a whole new re-think which has begun to permeate many of Britain's scientific corridors of power.

Although Britain has been the leading scientific force in Europe for a number of years, long spending virtually as much on research and development as France and Germany put together, she has not benefited economically from such an investment. And a number of politicians and industrialists have naturally become disenchanted. They point to the rapid advances made since the war by the two vanquished nations, Germany and Japan—examples which forcefully demonstrate that economic progress has little to do with research and development effort but is first and foremost a matter of installation of new plant, shrewd accountancy and hard work.

It was therefore not surprising that the Labor Party, which had become sensitive to these issues and promised a technological revolution, was swept into office in 1964 with a large industrial vote of confidence.

Socialist Science

One of the first pieces of legislation to come from the Labor Government was the Science and Technology Act of 1965. This called for fundamental research responsibilities to be handed over to the Department of Education and there re-organized between the three existing research councils: the Science Research Council, the Medical Research Council and the Agricultural Research Council. The Natural Environment Research Council was brought into being to rationalize the situation and to help pave the way towards a greater commitment to the so-called 'socially useful' sciences. At the same time the Social Science Research Council was also set up and for similar reasons. Finally, to co-ordinate over-all policy, the Council for Scientific Policy was established.

The mission-oriented research and development groups—notably the Atomic Energy Authority, the National Physical Laboratory, the National Engineering Laboratory and the Radar Research Establishment—were brought together to form the nucleus of the new Ministry of Technology. Since then, the Ministry of Aviation has been dismantled and its research laboratories—principally the Royal Aircraft Establishment and the Gas Turbine Research Establishment, both at Farnborough—have been transferred to Mintech.

The over-all result of this rather formal restructuring of British science and technology is that the growth of fundamental research is being checked, while certain key areas of civil applied science—in particular, computer technology, automated machine tools, desalination and fast breeder reactor systems—are being rapidly expanded. While the majority of scientists and engineers in Britain agree that this special emphasis on technology is long overdue, many are beginning to doubt the wisdom of holding down growth in basic research.

The critics argue that because the total amount of money passing through the C.S.P.'s hands each year is only around the \$200 million mark—equal to about a tenth that of the Ministry of Technology's budget—it is meaningless to pinch

pennies from the research councils. Indeed, it is quite likely that the research councils' annual 1 per cent reduction in growth is lost in depreciation alone, and that the only effect of this penny-pinching attitude is the erosion of morale in a number of the country's leading research laboratories and an acceleration in the draining of the most talented brains to the United States.

Symptom of Change

Perhaps because the British have lived so long undisturbed by domestic revolution or foreign invasion they really have become stuck in the mud. Innovators—and the country is full of them—often find it impossible to get their ideas accepted. The atmosphere is against them. The attitude to change seems strongly hostile. Anthony Wedgwood Benn, Minister of Technology, dwelt on this theme at a recent conference entitled "Devaluation, Technology and the Trade Unions." This is what he told the Trades Union Congress: "Put bluntly, the only solution to Britain's economic weakness is to be found in the application of modern technology more rapidly in British industry. The average American worker produces two and a half times as much as his British counterpart. . . . The success of American industry in creating wealth at a rate that allows them to pay their people more can be attributed directly to the level of technological development that they have reached.

"Surely over the past 25 years we have had enough experience of alternative methods of solving our problems. We have tried to solve them by boom, and it has always ended in crisis. We have tried to solve them by deflation, and it has always ended with unacceptable unemployment. We have tried to solve it by borrowing, and it has always involved limitations on expansion. Now we have tried to tackle it by devaluation, but we know that devaluation without real industrial efficiency cannot succeed."

What Wedgwood Benn had in mind was the knowledge that American industry is backed by a far greater investment per head than is the case in Britain, and that this investment in new plant and equipment has been largely financed out

of surplus wealth created by greater productivity in earlier years. So, apart from spending money on technological projects with future export potential, the Ministry of Technology is also investing heavily in research into management, component design and development, and marketing techniques. It is perhaps a little late in the day (just as devaluation, too, was long overdue) but the indications are that, if this special emphasis on advanced technology is sustained over the next decade, industrial momentum will build up to a point where there will be sufficient capacity to sustain a domestic boom without impairing export performance. This is the goal. It is still a good many years away.

Nicholas Valéry is Deputy Editor of the British monthly magazine *Science Journal*.

Man's Fingerprints on His Environment

I find it hard to drive down the street these days without thinking of Vincent J. Schaefer. He pioneered cloud seeding research in the United States. Now he tells me that, in driving, I do far more wide-ranging seeding than he has ever done by dropping dry ice from aircraft or wafting silver iodide from his generators.

My car and yours put out something like 10 billion invisibly small particles a second when running. Lead in that exhaust combines with iodine found naturally in the air to form a rather effective cloud seeding agent. Dr. Schaefer finds lead iodide in air over all parts of the United States even in regions far from traffic concentrations.

It's part of man's grand unplanned experiment in global air pollution that has carried his aerial wastes to virtually all parts of the planet.

The ubiquity of car exhaust lead points this up. While Dr. Schaefer traces it in the air, Edward D. Goldberg of Scripps Institution of Oceanography finds it widely in the sea.

Spread by the winds and scrubbed out by precipitation, car exhaust now heavily outweighs natural sources in putting lead into the sea. Dr. Goldberg estimates that the United States alone accounts for 100,000 tons a year of this lead input. That's 10 times the natural contribution of all the world's rivers combined.

Then there's a mineral called talc. It's not a mineral likely to form part of natural air-borne dust. Men use it a lot to dilute pesticide powders for crop-dusting. And Dr. Goldberg finds it all over the planet. It shows up in rain, rivers, and glaciers, in aerial dust and in the sea. Talc used with pesticides in the fields of Europe and Africa has been identified in the Western Atlantic. Trade winds carry it 6,000 miles from its source.

Global Aspects of Pollution

In terms of health and well-being, air pollution's first challenge is to clean up the specific problems of specific regions. But increasingly, environmental scientists are becoming concerned about its global aspects.

With indicators like lead and talc, there's no question that the pollution permeates the biosphere. Man's dirty fingerprints turn up in Antarctic glaciers and the remotest parts of the sea. But no one knows what impact this may have on our environment.

Perhaps it influences our weather. Although he can't prove it, Dr. Schaefer thinks our inadvertent seeding has far-reaching effects. Now Director of the Atmospheric Sciences Research Center at the State University of New York, he has measured "cloud seeding" nuclei in the air for a decade. These condensation or freezing nuclei are particles around which water droplets or ice crystals form. He says the abundance of these nuclei has shot up tenfold in 10 years. It's gone even higher over some cities.

He attributes most of the increase to man. Besides car-exhaust lead, there's industrial pollution or smoke from vast areas of primitive slash-and-burn agriculture in Africa and Asia and so on.

Excessive cloud seeding can suppress rain by inducing clouds to form lots of tiny drops or ice crystals. This locks up moisture in a form that doesn't readily precipitate. Or, if there is plenty of moisture, it may let loose cloudbursts.

Dr. Schaefer noted this during a recent Seminar for Science Writers on Global Air Pollution which was sponsored by the American Meteorological Society and the National Association of Science Writers. "In Africa," he remarked, "there's burning before the rainy season. Clouds then often go to 40,000 feet without precipitation. Even then, they often produce ice streamers with very little rain coming out of the bottom."

He added that, "In the northeastern United States, more and more we get these misty rains rather than good precipitation. Or, if there's a lot of water vapor present, we get real downpours. Both effects are signs of excessive numbers of condensation or freezing nuclei. And, even before the water gets to the ground, it's polluted—and seriously polluted."

A Technological Pall of Dust

Besides this sharp rise in cloud seeding particles, man kicks up so much dust that he's casting a pall over the world. This too could change climate, in the opinion of Reid A. Bryson, Director for the Center of Climatic Research at the University of Wisconsin.

In the past, outbreaks of severe volcanic activity have put enough dust into the air to drop significantly the earth's average temperature, according to some climatic theories. Now, Dr. Bryson told the seminar, "Man has become the equal of volcanoes." In fact, he said, "Man now is mucking up the atmosphere to the point where he may be changing the climate of the world."

The dust comes from industrialization, slash-and-burn farming, regions where dust bowls result from poor land management, and all of the varied activities of our burgeoning population. The record of the glaciers tells the story. Year by year, as the ice layers form, they trap dust falling from the air. Dr. Bryson said that a Russian study of this frozen record "shows a twentyfold increase in air-borne dust over what it was before mechanization and industrialization in Europe, and it has shot up since 1951.

"Evidence we've been gathering indicates this increase in dustiness is worldwide. For example, the air's turbidity over Hawaii has jumped in the past 10 years. It has shown an increase of 30 per cent in a decade. That's probably representative of a large part of the Northern Hemisphere."

A dusty earth is a bright earth. It reflects more of the sun's energy so there is less to warm our planet. No one knows for sure what this means for weather.

But in Dr. Bryson's analysis, "It takes only a small increase in dustiness to raise earth's reflectivity enough to change the planet's average surface temperature as much as it has changed recently." From the early 1800's until about 1950, the average temperature rose slowly. But since that time, Weather Bureau climatologist J. Murray Mitchell, Jr., '50, finds that the earth has cooled.

"A 2 to 4 per cent increase in atmospheric turbidity will drop earth's temperature by 0.7° F., and that's about as much as it has dropped," Dr. Bryson said. "... It looks like this downturn in temperature is due to the rapid rise in dust. ..."

Dustiness can also change the temperature contrast between tropics and poles, a contrast that helps set the atmosphere's general circulation patterns. A change in this circulation would affect weather directly. Dr. Bryson thinks the pattern has indeed changed. He thinks a rise in dustiness has brought back the more severe Northern Hemisphere weather of the last century.

To back up his contention, Dr. Bryson showed how closely present weather patterns for various parts of the world approximate those of the past era. For example, he said, "For the last three years abnormal weather has been normal in the eastern half of the United States. Over the eastern half of the U.S. the kind of weather we've been having the past three years or so is like that of the early 1800's."

Weather Modification by Jet Aircraft?

Whether or not Dr. Bryson's suspicions about weather changes are right, man's air pollution has reached a scale where it's obvious we need to learn what its impact on the environment can be. Even jet contrails are suspect. At the National Center for Atmospheric Research (N.C.A.R.) at Boulder, Colo., you can watch the trails of transcontinental jets spread out to form wide thin bands of cirrus on a clear day. N.C.A.R. Director Walter O. Roberts often cites this effect to point up the need for finding out what we're doing to our environment.

Conceivably, the widespread cirrus formed by jets could change earth's heat balance and affect weather. But since no one bothered to learn the details of cirrus formation before jets, any subtle weather effects are virtually impossible to detect now. Yet, over the long run they might set an important trend.

Discussing this recently, Dr. Roberts said, "I am very gravely concerned with

inadvertent atmospheric modification for two reasons. First, some possible modification may institute long-term, even irreversible, changes. Secondly, we may not know, authoritatively, that we're doing it. We should commit now all the resources it is reasonable for us to commit to establishing bench marks for comparisons.

"We could have used quantitative data on cirrus formation," he explained. "Then, when we see jet trails spread out to form cirrus, we could judge whether such clouds would have formed naturally anyway on such days or whether a new factor has entered our environment. It's too late to make such bench mark studies when the new technology is here.

"We may be on the verge of this with the supersonic transport, although I'm less concerned about environmental modification with the S.S.T. than with the subsonic jet. But I could be wrong about the amount and significance of the water vapor it might add at heights of 70,000 to 80,000 feet. What is significant now is that we are not making the necessary studies of the natural environment prior to the contamination to let us keep tabs on this."

Disposal of Inhuman Wastes

Basically, all of this is a facet of the population boom. Man has practiced slash-and-burn farming since neolithic times. Only now has it reached a scale that sends smoke palls to 15,000 feet over Southeast Asia. Only now must we worry whether a continent or even the planet can adequately absorb our waste products.

From this viewpoint, the United States may already be overpopulated. N.C.A.R.'s James P. Lodge, Jr., illustrates this with the concept of the "energy slave" introduced by architect R. Buckminster Fuller. Including what it takes to produce the things we buy, every man, woman, and child in America has the energy equivalent of some 195 slaves at his beck and call, Dr. Lodge figures.

"These 'energy slaves' have their own waste products even as we ourselves do," he says. "The trouble is, they are not like our wastes. Many of them are new

on the face of the earth; some are acutely poisonous to all life, and very few of them have been around long enough for biological systems to have developed which efficiently remove them from the environment.

"As a result, in a very real sense, we are not trying to dispose of the wastes of 200 million people but of 39 billion equivalent people who produce a strange and inhuman kind of waste product."

As far as you can see into the future, this exotic population of man and his "energy slaves" will keep on growing. The most we can hope for is to learn to control its wastes to give us a livable environment. But first we have to find out what these wastes are doing and are likely to do to the earth. Only then can we plan intelligently how to manage our planet as we get on with the business of living in an increasingly crowded world.

Robert C. Cowen, '49, is Science Editor of *The Christian Science Monitor* and President of the National Association of Science Writers.

Only Human After All

The Double Helix: A Personal Account of the Discovery of the Structure of DNA (New York: Atheneum, \$5.95) by James D. Watson has received both notoriety and acclaim. There are more evident reasons for the former than for the latter.

It was front page news in the New York *Times* that the Harvard Corporation overruled the university's Board of Syndics, on the basis of objections to the manuscript by Dr. Watson's former co-workers, and ordered the Harvard University Press not to publish the book. From the sales point of view, this may turn out to be more profitable than being banned in Boston. The fact, however, is not irrelevant for readers since, unlike poetry or fiction, a work of history cannot be evaluated entirely in terms of its own content.

In 1951, James Watson came to the Cavendish Laboratory at Cambridge University for postdoctoral study and research, originally with John Kendrew, who was working on the structure of proteins. Before long, however, Dr. Watson and Francis H. C. Crick became increasingly involved in DNA, together with Maurice Wilkins and Rosalind Franklin at the University of London, who were already investigating its structure with x-ray diffraction techniques. By the spring of 1953, when Dr. Watson was 25, they had developed the helical model, for which in 1962 the three men (Miss Franklin died in 1958 at the age of 37) received the Nobel Prize for medicine and physiology.

The DNA molecule, they found, consists of two strands of the nucleotide material—chains of sugars and phosphates—twisted together in a double spiral, and linked by pairs of the nucleotide bases, adenine, cytosine, guanine, and thymine. In *The Double Helix*, Dr. Watson writes, "I relate my version of how the structure of DNA was discovered."

Excursion into the Past

His version, which has aroused such strong opposition from his colleagues and fellow Nobel laureates, is inseparable from the manner of relating it, for he has adopted a curious approach to this excursion into the past. He says,

"I have attempted to re-create my first impressions of the relevant events and personalities rather than present an assessment which takes into account the many facts I have learned since the structure was found." It is difficult to see what literary or historical purpose is served by this device, since the essential significance, for both the reader and the author, of a young man's autobiography, is its contemporaneity. But another purpose is served. By dissociating the present from the past, by describing the 25-year old Jim Watson of 1953 like a reflection (in time, rather than in space), he is able to speak in a way that would be inappropriate for the 40-year old Harvard Professor.

So, for example, throughout the book he uses the technique of ascribing to one person or group views about another that reflect unfavorably on both.

"He (Salvador Luria, his Ph.D. supervisor, a distinguished microbiologist now Sedgwick Professor of Biology at M.I.T.) positively abhorred most chemists, especially the competitive variety out of the jungles of New York City."

"Several fellow professors, however, watched this performance (Linus Pauling speaking at a meeting) with mixed feelings. . . . If only he had shown a little humility, it would have been so much easier to take! . . . A number of his colleagues quietly waited for the day when he would fall flat on his face by botching something important."

"Moreover, he (W. L. Bragg, Director of the Cavendish Laboratory) remained unconvinced that Crick was needed. Already for thirty-five years he had not stopped talking and almost nothing of fundamental value had emerged."

His depiction of Rosalind Franklin, who at first refused to accept the idea of a helical structure, is so extreme that in an Epilogue, he is impelled to place on the record a retraction, a revised evaluation of her work and personality as adulatory as the original was hostile.

It seems to me that this single instance, by raising the question of how many others there might be, throws doubt

on the validity of even his version of the discovery of the structure of DNA.

Other Perspectives on DNA

The experimental foundations and the reasoning leading to the discovery have been described more fully and in better perspective, on a popular level in John Kendrew's *The Thread of Life* (1966) and Francis Crick's *Of Molecules and Men* (1966), both reviewed in this column (see Technology Review, Apr., 1967, p. 7) and on a technical level in Dr. Watson's text, *Molecular Biology of the Gene* (1965).

In his book, Dr. Kendrew gives an admirably concise outline of the process of discovery, to which Dr. Watson's book-length account adds remarkably little of scientific substance.

"They (Watson and Crick) looked at the new x-ray photographs, they wondered about Chargaff's base-pairing rules, they tried out all sorts of models, and the upshot was that in only a few weeks, after one or two false starts, they actually solved the whole thing!"

It should be added that the concept of a helical structure was suggested by Linus Pauling's alpha-helix model of the structure of proteins, and that the trial-and-error technique of putting together atomic models to form a model of a molecular structure that fits the experimental data was also Pauling's.

"I would find it very hard to explain," Dr. Kendrew continues, "just how they did solve it—indeed I think they would find it hard, too. It is a good example of one of those intuitive jumps which happens in science from time to time. You may call it genius, you may call it inspiration, or what you will. One thing is clear, that the jump could not have been made earlier than 1953, because it absolutely depended upon a knowledge of the base-pairing rules and of the information contained in the improved x-ray photographs. But once these had become available it became possible to find the answer in a remarkably short time."

As Dr. Kendrew suggests, given the information, the same answer might have

occurred to a number of other investigators. In fact, the answer was on the tip of Linus Pauling's tongue. One of the reasons for his failure to get it down correctly on paper may have been that he was not given all the information. According to Dr. Watson's account, beating Linus to the draw required, in addition to the genius to find a brilliant solution quickly, withholding a DNA x-ray photograph requested by Dr. Pauling; pumping Peter Pauling, working toward a Ph.D. under John Kendrew, about his father's work; and drinking a very, very silent toast to an error in elementary chemistry in Linus Pauling's proposed DNA model, as described in a letter to Peter.

Scientists as Human Beings

In almost all the acclaim bestowed upon *The Double Helix*, two words recur: one is *candor* and the other is *human*. In the contexts in which they are used, they both concern judgments about people that people would find unpleasant.

The first requires little comment. The candid views of a young man may be engaging and enlightening, even when mistaken. Such naive candor rings false, however, when it is recorded 15 years later; spontaneity cannot be retroactive. The present inevitably intrudes upon the past, for the reader if not for the author. In refraining from interaction with newly learned, external facts, there is danger of constructing a narcissistic fantasy.

The book has also been praised because it shows that science is a human endeavor and that scientists are only human after all. We know what is meant: scientists are just like all the rest of us. As Dr. Watson shows, they are flattered to be in the company of the famous, happy to enjoy the high life of parties and conferences, sometimes at government expense, and not above conniving to obtain fellowship funds.

Above all, because of the importance in their careers of priority of discovery, they are very competitive, and no better than the rest of us in the way they try to win competitions.

Dr. Watson is fully aware of this connota-

tion of his personal history. "I do not believe that the way DNA came out constitutes an odd exception to a scientific world complicated by the contradictory pulls of ambition and the sense of fair play." I have not yet seen a review of the book that questions his view of the scientific enterprise or deplores it, if it is accepted as true.

I have no illusions about the essential morality that is supposed by some to be conferred upon scientists by the nature of the scientific process. Nevertheless, I am not convinced that the portrait Dr. Watson presents is characteristic in the world of science. In fact, I think it is more likely than not to be an odd exception.

Scientists are indeed human. But if that means to share only our less desirable qualities, then they are not like the rest of us at all.

In Brief

In *Technology in Early America* (Chapel Hill: University of North Carolina Press, \$4.50) Brooke Hindle, Professor of History at New York University, has provided an important source book for research in the development of technology in the United States to about 1850. His introductory essay emphasizes the central role of technology in early American history, while his detailed bibliography is not only very useful, but makes equally interesting reading. Also included is a directory of artifact collections, compiled by L. F. Ellsworth.

In 1966, two major American universities, the California Institute of Technology and the University of Chicago, observed their 75th anniversaries. As part of their celebrations, each sponsored a conference, and now each has published the conference papers in a book. The CalTech volume, *Scientific Progress and Human Values* (New York: American Elsevier, \$7.50), edited by Edward and Elizabeth Hutchings, reviews some recent advances in the physical sciences, biology, and technology, and then considers "how scientists and engineers can join their energies with humanists, social scientists,

and others" to serve human needs better. The Chicago conference is reported in *The Arts and the Public* (Chicago: University of Chicago Press, \$6.50), edited by James E. Miller, Jr., and Paul D. Herring. Leading practitioners and critics in three major fields—fiction, drama, and art—have written essays that are lively and scholarly, though not always related to the major theme.

I cannot help thinking that both conferences might have been more fruitful, if the two sets of speakers had been interchanged.

New from the M.I.T. Community

Formulation of Research Policies, edited by Lawrence W. Bass and Bruce S. Old, Sc.D. '38. Washington: American Association for the Advancement of Science, \$7.75. Papers presented at a Gordon Research Conference (1966), at which 19 leaders in the field of policy formulation from the U.S. and 11 foreign countries analyzed and described science policies at national, international, and corporate levels.

Hands That Help, Bertha S. Dodge, S.M. '22. Boston and Toronto: Little, Brown and Company, \$4.75. A book on careers in medical technology—including occupational and physical therapy, microbiology, biochemical engineering, and library work—for high school students planning for training and work upon graduation.

Joseph Mindel is a member of the M.I.T. Lincoln Laboratory. He was formerly a teacher, department head, and administrator of science education in the New York City secondary schools. He has written on science education and the history of science and is the author of many radio and television plays. The notes "New from the M.I.T. Community" have been prepared by the editors of *Technology Review*.

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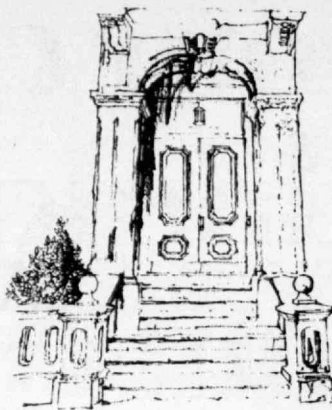
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Planning for Diversity and Choice:

Possible Futures and Their Relations to
the Man-Controlled Environment
edited by Stanford Anderson

Several of the distinguished contributors
to this volume discuss ways of dealing
with the future even though it cannot
be predicted.

Their general position is that the free
invention of many possible futures is to
be encouraged, with the condition that
these should be carefully criticized with
regard to such concerns as present
social welfare, accommodation, of
diversity, possibility of implementation,
and increasing range of opportunities.
This policy of invention and criticism
has been called "critical utopianism,"
in which the direction of the creative
imagination is constantly corrected by
the positive feedback of social criticism.

Another group of contributors address
themselves to related methodological
issues: social statistics, model-building,
and the positive role of proliferation in
the growth of knowledge or of a society.

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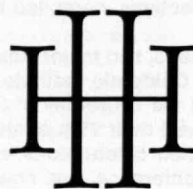
Air Transportation and Its Interfaces —
A Systems Approach to 1975 and Beyond

*edited by B. A. Schriever and William W.
Seifert.*

Air transportation is growing rapidly, and
approaching a critical condition. This
book is the report of an ad hoc group of
experts on air transportation and
affiliated fields who met at M.I.T.'s
Transportation Workshop to build a
systematic approach to this crisis from
their individual points of view. Their
purpose was not so much to define an
immediate solution as to recommend
a way of structuring the problem in
order to solve it. This is the first time that
a group of experts from industry,
government, and the academic world
have addressed this problem in a
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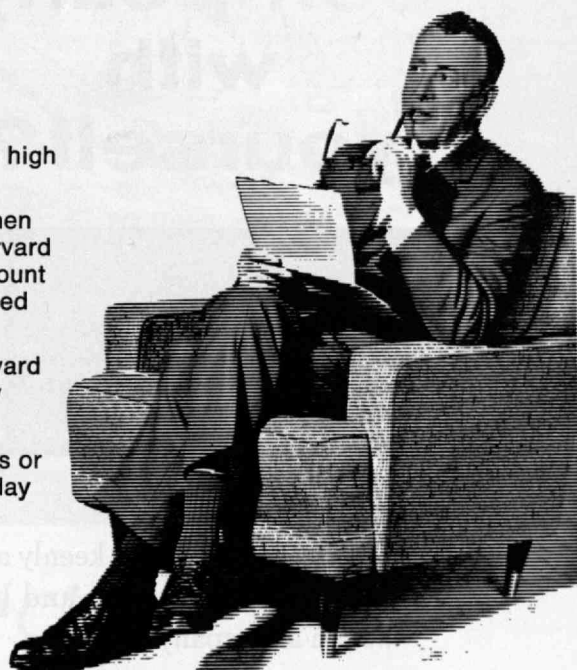
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Paul Feldman, BSAE University of Maryland '68, wanted to be sure he was making the best choice for his career, not just getting a job. He had some pretty pertinent questions when he talked to Bill Raynor at our plant in Evendale. Here are three of the more basic ones:



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PAUL: "If I join your Engineering Program, what are the chances for advancement?"



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that is important. Your contribution to the business determines when you'll move up in responsibility and authority."



PAUL: "Do you reimburse engineers for higher education?"

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Paul Feldman wanted to know...we told him

Paul's questions and Bill's answers resulted in Paul joining the General Electric Evendale Engineering Program. If you have, or are about to get a BS/MS in Mechanical or Aero Engineering and have some good questions, why don't you talk to Bill Raynor. You can call him collect at (513) 243-6484. If that's not convenient, write Mr. Wm. Raynor, Entrance Programs, Sect. 866, Aircraft Engine Group, General Electric Company, Cincinnati, Ohio 45215. An equal opportunity employer, M/F.

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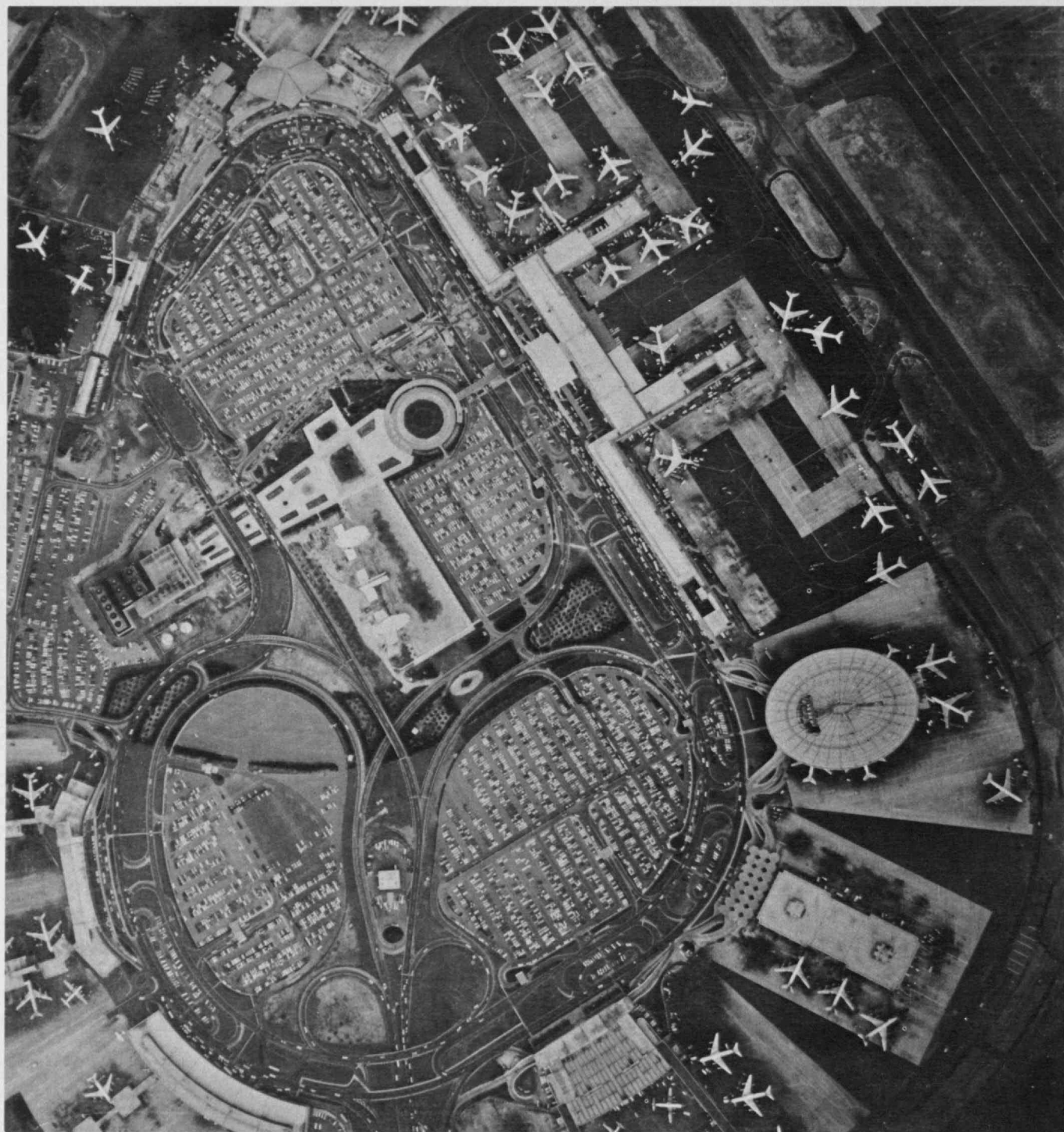
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Utopia does not lie ahead. But partial solutions embraced at once will permit total planning to stem the tide of congestion

Bernard A. Schriever
and
William W. Seifert, Sc.D.'51

The Impending Crisis in Air Transportation

The people of the United States enjoy a personal mobility unmatched anywhere in the world, a freedom of movement regarded as a right and not a privilege. It is a social value woven deeply into our lives. The freedom to travel and to trade without barriers is the basis of the mass production and marketing that have given us the highest standard of living man has known.

But unless we begin now to take steps to meet the demands of the future, sheer growth in population and the accompanying economic demands could so saturate our transportation system, especially the air system, that mobility could become a premium service instead of a routine accommodation.

In 1966 air transportation accounted for 66 per cent of common carrier passenger miles, as compared to 13 per cent in 1950.

Many factors will further stimulate the growth of air transport. Gross national product, disposable income, and employment are increasing. A new generation of even more economical, high-payload aircraft is coming into service. More people will have more leisure time; some of it will be used for travel. The number of retired persons will increase, and they will wish to travel more. A higher percentage of our population will be more highly educated, and past experience shows that as level of education increases, so does the tendency to travel. Many people in today's travel market still cling to an old-fashioned fear of flying, which helps account for the fact that, as of 1964, only 39 per cent of Americans had ever taken a trip by air. The generations coming into the air travel market will not bring a fear of flying with them, and this will expand the market even further.

These factors of growth lend credence to median forecasts that by 1980 the number of domestic revenue passengers carried by airlines will be four times more than current levels and that air cargo will grow as much as 10 times.

Some Inhibitions to Growth

But serious hurdles face those who are charged with preparing the facilities on which this growth will depend. Any casual air traveler or shipper recognizes signs of trouble in the delays and congestion that have today become the norm. Up until now, the growth of air travel has been relatively unhampered by capacity restrictions, but these favorable conditions are fading rapidly. The factors that may do most to limit the ability of the air transportation system to meet demand are the most difficult to evaluate and to correct.

Most of our hub airports are reaching a saturation point, and saturation equates with costly delays—costly in terms of the ill will of inconvenienced passengers and costly in operating losses to airlines. The Air Transport Association estimated the direct cost of operating delays in 1965 at \$41 million, no small economic drain yet relatively insignificant when compared to the potential delay costs in the coming decades. Serious new problems will be introduced when the large subsonic jets and the supersonic transports are introduced into the inventory. Estimates indicate that by 1975 20 aircraft of the C-5, B-747, or SST type will land or depart within one hour at primary airports during peak times. This indicates a need to accommodate up to 10,000 passengers per hour at these locations.

In 1965, 21 major metropolitan areas accounted for 66 per cent of the total airline passenger enplanements and 48 per cent of all air carrier operations at U.S. airports. As a group, these large hubs have, over the years, increased their share of the total U.S. air traffic for both air carrier and general aviation activities. This trend is forecast to continue. Projections indicate that by 1980 these hub airports will account for approximately 70 per cent of all U.S. enplaning passengers.

In 1965 only three large hubs, New York, Chicago, and Los Angeles, generated more than 6,000,000 enplaned passengers each. By 1980, 20 of the large hubs will generate this number annually, according

to F.A.A. forecasts. The number of air carrier operations will also increase markedly, but, because of the shift to larger aircraft, these increases will not be proportionate to the gains in passenger volume. Between 1965 and 1980, air carrier operations at the 21 major hubs are expected to increase 143 per cent and passenger enplanements 444 per cent.

For example, in 1965 the seven airports that form the Miami hub accounted for about three million enplaned passengers. By 1980 airports in the Miami area must be ready to handle nearly 19 million enplaning passengers. To accommodate this growth, Miami will need five times the total air carrier terminal space it has now. It will also require four times the amount of apron area for carrier aircraft, four times the present cargo building space, and six times the amount of existing cargo apron area. The projections for the other large hubs are similarly dramatic. F.A.A. forecasts indicate that the New York hub's present 4,213,000 square feet of gross terminal area (including the expansion at Newark) must grow to 8,864,000 square feet plus 500,000 square feet for international travelers; Chicago's 1,788,000 square feet will have to expand to 6,792,000; and Atlanta will have to find ways and means to build 2,375,000 extra square feet of terminal building to process its forecast traffic.

Similar requirements exist for all the major hub areas—a fact that indicates the extent of the terminals' portion of the problem. The airports themselves face comparable problems and must be expanded to accommodate the larger number and size of aircraft, turning these expensive machines around quickly for departure with fuel, maintenance, passengers, and cargo. The prospects for moving passengers and cargo to and from airports through urban distribution systems that are becoming less adequate each year are even more dismal. (Today not a single hub airport is directly connected to the central city by a fast subway or railroad system.) And there is also the problem of how to control the growing numbers of aircraft that will be occupying the airspace, including takeoff, routing, and landing, within acceptable standards of safety, noise, and pollution.

It is difficult to predict what will finally limit the capacity of individual airports. It could be airport access and egress. It could be the ability of the air traffic control system to handle arrivals and departures. It could be the terminals themselves—the number of people that can flow through them in a given period. It could be the ground-handling facilities for airplanes. A recent study by the General Manager of Los Angeles International Airport indicates that this airport's capacity will finally

be limited not by terminal, runway, ramp, or parking facilities but by the capacity of the external road system that brings passengers and cargo to the airport and carries them away. Each airport is unique; each has unique problems. But delays at any major airport back up to cause system-wide delays as equipment fails to arrive on time and schedules deteriorate.

One factor threatening to limit air transportation system growth is paradoxical. General aviation—the air taxis, fixed-based operators, company and private airplanes that play a key role in supporting the industrial and service bases that make our air transportation system possible—is growing so rapidly that it, alone, will absorb anything short of extraordinary future expansion of air traffic control and ground-handling facilities. In 1966 general aviation accounted for 16.2 million aircraft operations at airports with F.A.A. traffic control services, as against 8.2 million commercial operations. The F.A.A. forecasts that by 1977 general aviation will generate 54.9 million operations, as compared to the carriers' 16.9 million. By 1980 the scheduled air carriers' 3,600 aircraft will have to vie for air and airport space with 210,000 general aviation aircraft, more than double today's fleet.

It was the jet engine that made large and efficient aircraft possible, and we are committed to it until another form of propulsion is invented. Jet engines, unfortunately, make noise. No solution to the noise problem is yet in sight. Jet engines also pollute the air. Fortunately, this pollution is not as serious as would appear from the smoke trails left by jets, but it is serious enough to make people complain. As antipollution devices become more common and begin to reduce the pollution from such offenders as cars and factories, the atmospheric pollution contributed by today's aircraft will assume a proportion of the total that will attract increased attention. Noise and pollution will lend pressure—emotional but perhaps unbearable pressure—to move airports farther from our cities. They will force the imposition of noise-abatement flight procedures which are even more restrictive than the ones that are already shrinking critical airspace and raising operating costs. Financing the building of new airports is going to offer a major challenge if noise and pollution force the issue.

Locating suitable real estate is going to present another problem. An important inhibition to growth is indicated by the comment that on a clear day from the top of the Empire State Building one can see 1300 separate political jurisdictions. When a community is forced by congestion to the decision to build a new airport, that new airport will most probably have to be built on land belonging to another community. Roads and other access sys-

tems to the new airport will generally have to cross real estate controlled by several other communities. The resulting jurisdictional problems can create years of delay before concrete is poured, and they can force compromises that must inevitably result in less-than-optimum facilities. The delays occur as a function of local prerogative. The compromises are a consequence of the fact that airport planners employ criteria that differ from those used by urban and highway planners, and planning for these seemingly diverse but actually interrelated ends is being conducted for the most part by men working in isolation from each other. Taken together, these problems may completely block the building of badly needed new facilities.

By far the most difficult growth constraint facing the air transportation system is that of financing. At a point in time when U.S. airlines are committed to the purchase of \$10.5 billion in new equipment through 1971, austerity programs are forcing adoption of a federal fiscal policy that passes to the users the responsibility for paying for a greater share of the system. The airlines have been told, in effect, to make the service fit existing fiscal policy rather than to expect fiscal policy to evolve to permit development of the desired service. This policy portends inadequate traffic control facilities and overburdened controllers. New airports, improvements to airports and new access systems must be planned against lowered federal assistance. Because the crisis is so near and the lead times for constructing new facilities so long, austerity measures could not have come at a worse time for the air transportation system.

Clearly, no one yet knows specifically what steps should be taken to optimize the performance of our air transportation system while adequately protecting other segments of society in the face of this impending crisis composed of so many contributory factors. But it is nonetheless possible to outline some system-oriented options for the planner and some recommendations for further study.

The Airport Problem

The projected increases in air passenger traffic lead one to conclude that even if concurrence had been achieved among the jurisdictions involved, if plans had been approved, and if financing were in hand, new terminal facilities could still not be constructed soon enough to forestall peak-hour congestion of epic proportions. Consequently, the near-term solution must be found in increasing the flow of passengers through today's facilities and along the access routes to them. Fortunately, considerable early relief is available, although achieving it will require abandonment of traditional ways of processing passengers.

Co-ordinated, system-wide adoption of automated ticketing and baggage processing, which are within the present state-of-the-art, would go far toward eliminating a major bottleneck in passenger flow through terminals. This in itself would offer relief, but if such a system were incorporated in a complex of passenger-processing satellites strategically located within and close to urban complexes, a large part of the terminal congestion problem would disappear and some of the staggering estimates of future terminal space requirements could be modified. Automobiles could be driven to the satellite instead of to the airport. Well-wishers would not have to accompany passengers to the airport or go there to greet them. Transferring the passenger and his baggage from the satellite to the airport could be handled on an evolutionary basis, beginning with standard large-capacity buses, limousines, and taxis. If satellite locations were planned with the airport access problem in mind, such a primitive system could evolve to a ground transit system carrying the passenger to the airport and, in follow-on refinements, bringing him directly to the skin of the aircraft. While such a plan may be distasteful to air travelers who have been conditioned to expect fancier treatment, the alternatives, with their delays and frustrations, may prove to be even more distasteful.

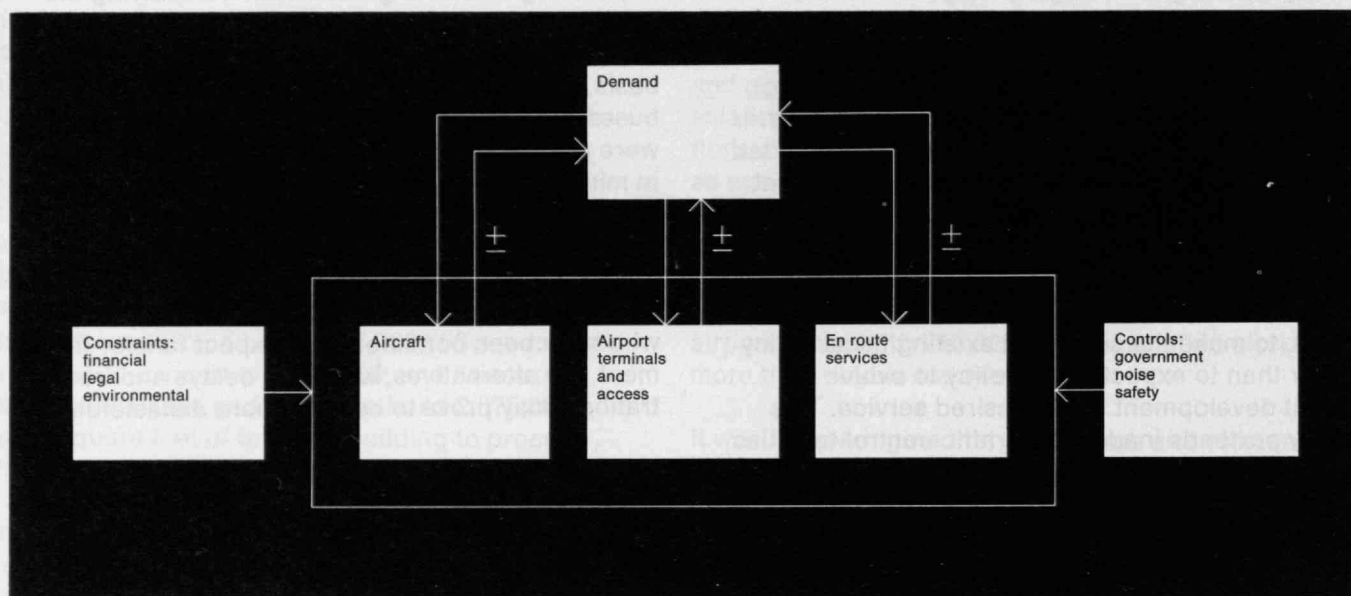
The plan has other advantages. An airport that did not have to devote so much space to classical passenger facilities—ticket counters, circulation areas, concessions, public conveniences, waiting rooms—could then devote more space to its proper business: landing, maneuvering, servicing, and loading airplanes. An airport that did not have to devote so much space to car parking might find room for extra gates, ramps, and taxiways—and in some cases, for a parallel runway that would nearly double the acceptance rate for landings and takeoffs.

Carrying such a plan to its logical end, other typical airport functions could be moved off-airport. This would include cargo-processing functions such as containerization, palletization, and break-bulk operations, as well as heavy aircraft maintenance and overhaul.

Compared to requirements for the construction of new airports, satellite system requirements are not immoderate; satellites could probably be in operation sooner and at lower cost. Adopted as a standard for future airport planning, the satellite plan could end the traditional ways of thinking about airports, which otherwise will continue to create periodic crises in the air transportation system.

Such a plan will undoubtedly run into serious opposition on the grounds that the income from

The diagram below represents the air transportation system as three subsystems—the air vehicle, en route services (airways, navigation, approach control, meteorology, and radiation monitoring), and the airport and terminal with their access and egress systems. The subsystems are interdependent, and deficiencies in one subsystem affect all the rest. The flow of new aircraft into service occurs at a rate that is almost a pure function of marketplace decisions. However, the two supporting subsystems, the en route services and the airport, lag behind. The air transportation system operates in a dynamic environment composed of people and their economy. The burgeoning of population, industry, leisure, education, and disposable income creates new and expanding markets. On the other hand, factors such as noise, pollution, and legal, financial and jurisdictional problems act to restrain their growth. Policy considerations, operating in the public interest, also serve to control demand.



support facilities at airports is necessary to maintain the airport's principal functions; consequently, the development of a system of satellite collection-distribution points will require a new view of airport financing. The satellite plan would also benefit materially from standardization by the major airlines of passenger- and baggage-processing methods, an agreement which may be difficult to obtain in view of the competitive aspects of air travel.

The noise problem associated with the operation of jet aircraft is a difficult one, for a quiet engine is not on the horizon. In time a set of acceptable noise standards will be established, and compatible land-use plans to attract industrial rather than residential development to the periphery of airports will gradually be evolved. These steps and the imposition of restrictive noise abatement aircraft routing procedures will help. Nonetheless, mounting opposition can be expected from those citizens who live within the high-noise patterns of airports. It is clear that we are not going to stop flying, but it is equally clear that we could attach so many penalties to investment in commercial aviation that it would cease to attract investors.

As far as the competition from general aviation for airport facilities is concerned, the solution appears to lie in providing equal but separate facilities for general aviation at reliever airports in hub areas, a solution that takes into account both the traditional freedom to fly and the fact that it is not in the public interest for a private airplane with two persons in it to delay a commercial aircraft carrying perhaps 500 passengers. It also takes into account the fact that, while rising general aviation activity will certainly affect congestion in the air, its major impact on the ground will be felt at only a small percentage of the 10,000 airports in the United States.

Air Traffic Control

If air traffic is to grow with the national economy, the airspace must be treated as a national resource and public funds must be committed. A new traffic control system will have to be developed to augment and perhaps eventually replace the present radar-based system, which will be inadequate for the anticipated traffic. Technology is ready and waiting to computerize and combine the meteorological, navigational, control and communication data fed through the air traffic system; realization

of this objective would go far to improve safety and to relieve the nerve-wracking burden shouldered by air traffic controllers.

A decision to require general aviation aircraft to install adequate avionics packages or be restricted is obviously difficult to make. Similarly, it is not easy to decide to impose requirements such as minimum speeds and pilot proficiency standards on general aviation, yet there seems to be no alternative if we are to avoid unsafe conditions and delays in the airspace. Our system, although recognizing every citizen's right to use the national resources, also contains precedents for restricting that right in the public interest.

Air Freight and Cargo

The rosy forecasts for the growth of air freight and cargo probably disregard a great many hurdles that must be cleared before these levels are attained. Many potential shippers do not understand air logistics as a means of increasing sales and profits by enlarging market areas, increasing the length of time perishables and style-obsolescent products can be on the market, lowering inventory costs, and reducing the time between shipment and payment. Computer-aided analyses of distribution costs have not been made available to industry and commerce on a sufficient scale. The advantages of containerization have not been made apparent, nor has the requirement to develop containerization that is compatible for all modes.

Spectacular potentials for domestic and world trade are available with the high payload, low ton-mile-cost aircraft that are coming into service. These potentials may be lost unless co-operative planning can reduce the cost of air cargo service, encourage potential shippers to organize for total distribution cost management, standardize containers, reduce the paperwork required for air commerce, and develop suitable air cargo facilities and equipment. This order of planning will demand the combined efforts of shippers, airport operators, air carriers, aircraft manufacturers, and government planners.

Fiscal Policies

Tremendous sums will be required for financing the expansion of airport and terminal facilities, the introduction of new air traffic control systems, and the construction of new and improved access means. It is evident that no single sector of the economy will underwrite these requirements *in toto*. It is equally apparent that a systematic approach to financing cannot be developed until data on the operation of the total system can be assembled and reviewed. Unfortunately, fiscal operations in the air transport are so fragmented that it is essentially impossible to assemble consistent data. Furthermore, estimates of future costs show such divergence that

they do not provide an adequate base for decision making.

Future developers will look to the federal and state governments for assistance in the form of grants, loans, and tax incentives. The private investment sectors, and the users too, must assume a share in the financing to ensure that free competition is not replaced by excessive governmental restraint. However, unless and until adequate data are developed and organized, the prospects for articulating an effective fiscal policy are not bright.

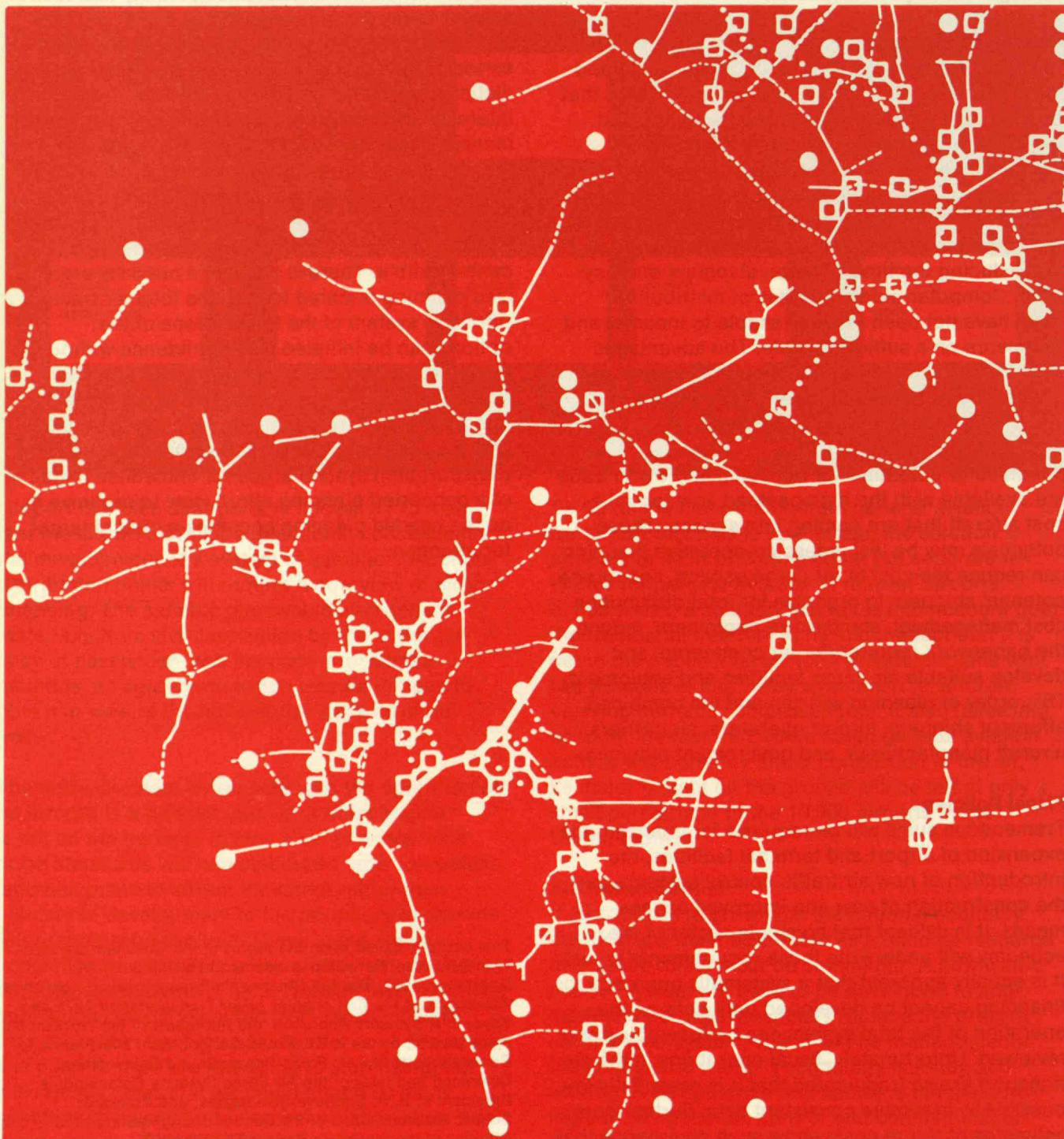
Transportation Policy

Utopia does not lie ahead. It is not likely that technology, for all the blessings it may bring, will give us a world free from noise, pollution, traffic jams on the ground and in the air, irate travelers, jurisdictional quarrels, or selfish public and private interests. Our problems now are taking on a new dimension, with the result that today the crux of the matter lies not in the realm of what technology can do but rather in what we want it to do.

One conclusion stands out, unmistakable and incontrovertible. There is an urgent need for organized planning oriented toward the total air transportation system of the future. None of the options can be initiated with confidence without further study to close the gaps in data and knowledge. The options represent at once opportunities and problems. The selection of the best options and the solution of other problems facing the air transportation system argue for immediate initiation of a concerted planning effort. How to organize to do the needed planning becomes a critical target for attention.

This essay is based upon the report of the Co-Chairmen of a Transportation Workshop conducted between June and December, 1967. The full Chairmen's Report is being published this month as the first chapter of *Air Transportation 1975 and Beyond: A Systems Approach*, the full report of the Workshop's many panels, by the M.I.T. Press. General Schriever, formerly Commander of the Air Force Research and Development Command and later of the Air Force Systems Command, is President of B. A. Schriever Associates; and Professor Seifert, Assistant Dean of the School of Engineering at M.I.T., is Director of the Institute's Project TRANSPORT.

Computer simulation of a cascade of atom collisions which results when a high-energy neutron strikes one atom in a crystal of iron (large red dot at lower left). Plain and dotted lines show movements of atoms in the crystal following collisions brought about by the original impact of the neutron. White dots represent the final positions of atoms which have been knocked out of their regular places in the crystal into interstitial positions and red squares represent regular lattice positions from which atoms have been displaced. The effect of nuclear particles on crystals is analogous to that of a high-speed bullet on a vast array of compressible, rapidly oscillating billiard balls. (Data: J. R. Beeler)



Materials Engineering for Nuclear Power

In many ways the design, development, and fabrication of materials have controlled our advancing steps in the practical use of nuclear energy. Nuclear fuels—alloys or compounds containing fissionable isotopes—are the most obvious examples of the influence of materials technology. At the start of nuclear power history these were new and unknown as materials of construction, and it has required a concerted research and development effort over many years to establish suitable compositions, configurations, and fabrication practices for the fuels used in the present generation of power reactors. This effort must be continued as we move toward fast breeder reactors in the future.

Along with the nuclear fuels the use of many materials in nuclear reactors, including the more familiar structural alloys, has demanded the development of new or improved technologies. This necessity has generally arisen from two concerns—nuclear properties and reliability. In designing nuclear reactor cores, metallurgists were asked for the first time to attend to certain properties which characterize the interactions between moving neutrons and atomic nuclei. For good neutron economy, which reduces the mass of fissionable material required, structural materials in the reactor core must not excessively absorb neutrons. On the other hand, materials capable of absorbing neutrons strongly are needed for controlling the power level of a reactor. These control elements are moved out of or into the nuclear fuel assembly to increase or decrease the neutron level and raise or lower the reactor's power output. Other materials are required as moderators, to lower the energies of neutrons in a thermal reactor, and as reflectors, to minimize the leakage of neutrons from the reactor core. From this regard for nuclear properties a variety of new structural materials has now become quite familiar to nuclear metallurgists—magnesium and zirconium alloys for fuel cladding; hafnium, boron, and lanthanide elements for control; beryllium and beryllia for moderating and reflecting neutrons.

Reliability, the second—but certainly no less important—requirement for reactor materials has directed development efforts not only towards newer materials but also towards improving the quality of common structural alloys. Many components in the heart of a nuclear power system must remain in service for long periods of time with little, if any, periodic inspection or maintenance, because high radiation fields prevent access to these units. The designer must be sure from the beginning that these components will perform reliably and safely both in normal service and under all possible abnormal conditions. The potential hazards which might arise from the unexpected failure of a vital reactor component are vastly more serious than hazards in any other industry, and the demands for reliability of these components must be correspondingly high. Corrosion, creep, fatigue and wear, the long-term service problems present in many materials applications, often take on greater importance in nuclear plants because of the more stringent requirements.

Consider corrosion as an example. Most industrial corrosion problems relate to structural integrity; the concern is to prevent progressive weakening of a structure as it loses material by corrosion. In a typical water-cooled nuclear reactor the concern is of a somewhat different nature. Passages through which the cooling fluid flows are narrow, and the specific power is high; fouling of a heat transfer surface or blocking of a flow channel with corrosion products could quickly cause the fuel to melt. Further, corrosion products which are highly radioactive, particularly those from the nuclear fuels themselves, might be circulated and deposited in parts of the system away from the reactor, and restrict or entirely preclude access to units which are otherwise approachable. Thus, the continuing concern in developing corrosion-resistant materials for reactor construction has been not so much one of structural integrity but rather one of the disposition of even miniscule amounts of the products of corrosion. This is only one illustration of a distinction between the interests of

metallurgists involved with nuclear reactor design and those in other industrial fields, even when they are looking at the conventional properties of materials.

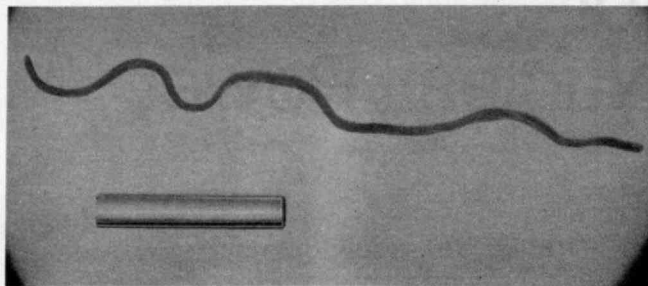
The Limitation of Radiation Damage

Without question, however, the new and unique addition to the materials limitations confronting the reactor designer is radiation damage—changes in the properties of materials which result from prolonged exposure to nuclear radiation. This effect manifests itself in many forms. The vacationing Yankee usually becomes painfully aware of radiation damage as he watches himself turn red after his first day on a Florida beach; the purple windows on Beacon Hill increase their value and enhance the status of their owners with exposure to the sun through the years. Prior to the advent of nuclear power, however, the chief industrial concern with radiation effects (other than sunburn lotions) was the bleaching of textiles or the fading and decomposition of paints in strong sunlight.

The intense and energetic radiation present within a nuclear reactor is in a different class; it can profoundly change the properties of all materials and introduce effects which are usually detrimental. The same window glass which reaches its delicate hue only after a century or so on Beacon Hill would turn to an ugly and opaque brownish-black after a few seconds' exposure in a nuclear power reactor. Wood, plastic, or any other organic solid would be rapidly degraded or decomposed. In fact, metals and the most stable inorganics are the only solids which can be used as structural materials in reactor cores, and even these are affected by the radiation, sometimes to a striking degree. The figure above shows the severe effect of neutron irradiation on uranium metal. Not only is the piece grossly distorted, but it has also become excessively brittle and has lost all its useful mechanical strength. This is an extreme example because uranium is fissionable, and the large energy release from fissioning of atoms within the piece has caused the dramatic effects. However, similar alterations, to a lesser degree, are observed in many metals.

If we set aside radiation effects for the moment and consider the environment that materials must withstand in a nuclear reactor in comparison with other industrial applications, it is not apparent why the nuclear metallurgist feels particularly challenged and sometimes sorely pressed. Temperatures are not nearly as high as those in a rocket nozzle, which demands very refractory materials, nor is the combination of temperature and stress as severe as in a turbine blade, for which "super-alloys" have been developed. Although corrosion is always a prime concern, the reactor environ-

Extreme distortion and loss of mechanical strength result in a rod of uranium exposed to irradiation by neutrons; the dummy below the distorted rod shows its original size. Since uranium is a fissionable material, it undergoes spectacular changes when irradiated; however, irradiation causes some distortion and loss of strength in many metals. Materials engineers must try to minimize these effects in structural materials used in nuclear reactors. (Photo: from A. N. Holden, *Physical Metallurgy of Uranium*, 1958, Addison-Wesley, Reading, Mass.)



ment is almost benign when contrasted with the possibilities in the chemical industry. But when we superimpose the intense fields of high-energy radiation, all the problems associated with developing materials to perform reliably multiply greatly. Radiation damage, then, becomes a contributing factor through all facets of materials engineering.

Reactor Engineers Face the Unexpected

One example, a serious problem under active study at present, will illustrate the complex and sometimes unexpected nature of radiation effects and their influence on engineering design. A few years ago British metallurgists, and later others, reported that neutron bombardment markedly embrittled stainless steels when these alloys were irradiated and tested at temperatures around 800°C. This was surprising because irradiated stainless steels tested at lower temperatures were not excessively brittle, and metallurgists knew that the effects of irradiation are generally less severe when the material is heated to high temperature. Although 800°C. is well above the required service temperature of water-cooled, thermal reactors, these unexpected results were distressing to engineers contemplating higher temperature designs for the liquid sodium-cooled or gas-cooled fast reactors.

Subsequent developments have established the general nature of radiation embrittlement at high temperatures. In stainless steels this damage results from nuclear transmutation of boron, which is a natural impurity in these alloys. The boron atom readily absorbs a neutron and splits into a lithium atom and an alpha particle; electrons from the metal then neutralize the charged alpha particle to form a helium atom. Thus, the effect of neutron bombardment is to generate inert gas atoms in the solid. At high temperatures these gas atoms are mobile and coalesce to form helium bubbles at

grain boundaries (internal surfaces) within the structure. The buildup of microscopic bubbles in the grain boundaries progressively degrades the ductility of the steel at high temperature.

It is impressive that marked embrittlement of stainless steels will occur even if the boron impurity level is kept to a concentration of only a few parts per million. Although it may be possible to mitigate the effects of boron by suitable alloying additions, a similar problem remains for high temperature fast reactors. In these designs the average neutron energy is high (hence the term "fast"), and transmutations of iron, nickel, or other *base* elements, not necessarily impurities, occur more readily than in thermal (low neutron energy) reactors. These transmutations generate helium and hydrogen in the alloys now being considered for fuel claddings. It has been calculated, for example, that the concentration of hydrogen and helium in stainless steel will be of the order of a few tenths of 1 per cent after the required service period in a large fast reactor. This is a thousand times more than the amount of gas produced by boron transmutations in the experiments described above, and the implications as to the possible degradation of the mechanical properties of the material are evident.

In addition to the potential effects of fast neutron transmutations, the materials used in future fast reactor cores will have to sustain exposure to fast neutrons an order of magnitude greater than ever before required, and the *rate* of damage will be at least an order of magnitude greater than has ever been achieved in experiments. It is clear that the engineering challenge is well defined; materials must be found or developed to withstand the hostile environment in a fast reactor if these future plants are to supply our rapidly increasing power demands. Thus, the scene of the action shifts to the research laboratory.

Building up the Theory

The study of the basic nature of radiation damage involves a spectrum of disciplines from radiation physics to physical metallurgy. Historically, we can trace back to the particle scattering experiments of Thomson, Rutherford, and Lenard around the turn of the century. These gave the first indications of the interactions between beams of charged particles and the atoms in a bombarded solid, and their scattering formulas are our starting point in radiation damage theory. The early 1940's produced the first suggestion that radiation bombardment could induce certain permanent changes in solids. In conjunction with the work on Fermi's pioneering nuclear reactor, E. P. Wigner predicted that energetic neutrons colliding with atoms in a solid could knock the target atoms out of their

lattice positions in the crystal. He made his calculations for graphite, an effective reactor moderator, and the phenomenon was later experimentally observed as dimensional distortions and the accumulation of stored energy in graphite exposed to reactor neutron bombardment. "Wigner's disease," as this was called, can be severe in graphite; in fact it led to the serious accident at the Windscale reactor in England.

Many experiments have confirmed that lattice displacements, the knocking of atoms from their positions in a crystal, are the essence of radiation damage in metals, but we should note in passing that materials in general are subject to many other effects. Excitations and ionizations are important in dielectrics and semiconductors, altering the optical and electronic properties of these materials, and the destruction of chemical bonds is responsible for the rapid deterioration of organic substances under energetic radiation. From a structural engineering standpoint, however, it is the generation of lattice displacements which influences the mechanical properties of irradiated structural alloys.

If a theory or model of radiation damage is to be accurate, it must first account in detail for the defects radiation bombardment produces in a crystal lattice and then predict how the observable properties, mechanical strength for example, relate to the defect structure. Both parts of this problem are complex and need deeper exploration.

To illustrate the analytical difficulties, picture the somewhat analogous example of a pocket billiards player starting a game by breaking the rack of balls. The cue ball represents an incoming high-energy particle, and the triangle of target balls is a small segment of the atoms in a solid. When the cue ball strikes the rack all the balls are scattered; their configuration after they have come to rest depends on collective interactions among themselves and on their interactions with the cushions around the table. The objective of radiation damage theory is analogous to calculating the final positions of the pool balls knowing only the velocity of the cue ball before it strikes the rack. To the extent that a pool shark has a "feel" for where the balls will go on a break he increases his wagering income. Similarly, researchers have a pretty good "feel" for the nature of radiation damage and can often speculate successfully about the effects of irradiation. A distinction arises, however, because the metallurgist needs to analyze the situation more quantitatively and objectively.

To carry the analogy further, making it more nearly representative, imagine that the target balls in the rack are not touching but are spaced slightly apart, that they are not stationary but are oscillating

rapidly about fixed points, that they are not hard billiard balls but are compressible rubber balls, and finally, that there are not just 15 of them on a plane but millions in a three-dimensional arrangement. Now imagine the extremely complicated problem of keeping track of the collective motions of all these balls when a high-velocity bullet is fired into the array. Such calculations, which require the extensive (and expensive) use of high-speed digital computers, have only been started in recent years (see figure on opening page).

Even when we can calculate the atom trajectories and the resulting disrupted configuration, we have not reached the end of the road. Atoms in a solid are always vibrating with thermal energy and are constantly moving from place to place in the crystal lattice. Consequently, the primary arrangement of defects produced by an impinging high-energy particle is only transitory, and the crystal immediately begins to relax from this highly distorted configuration. To continue the analysis we must be able to predict the course of thermal recovery until we arrive at the final configuration. Thus the whole problem contains two distinct parts—analysis of the primary damage and analysis of subsequent thermal rearrangements.

The final step in the theory is to relate the defect configuration produced by radiation to the observable properties of the solid. Here is the frontier of physical metallurgy, the prediction of physical and mechanical properties from a known defect structure, and here also is where radiation damage experiments serve as an important research tool. Bombarding solids with various radiations introduces defect structures which cannot be obtained by any other experimental techniques. We have, therefore, a means of augmenting information derived from changing the structure of a solid by more conventional processes, such as quenching or cold working.

Two New Irradiation Projects

In the end, exploring the microscopic nature of radiation damage provides both a science on which to base the engineering of devices which will experience particle bombardment—space instruments as well as nuclear reactors—and a fruitful contribution to the broad area of materials technology which seeks understanding of structure-sensitive properties. Two projects recently initiated at M.I.T. indicate our increasing interest in this exploration.

One of these is a co-operative research program with the metallurgy division of the Naval Research Laboratory in Washington, D.C. This program, which is supported at M.I.T. by the Office of Naval Research, provides a continuing interchange of

Hot laboratory, in which metallurgical studies can be made on materials exposed to radiation, is a central requirement in many areas of radiation damage research. This view of the Naval Research Laboratory hot laboratory shows a tape console to control a remote milling machine (left), and a metallographic examination area.



ideas and knowledge between faculty and students at M.I.T. and the engineering group at N.R.L., which has been at the forefront in evaluating the effects of neutron irradiation on structural metals. The co-operative program also makes available to M.I.T. graduate students the use of the N.R.L. hot laboratory (see photograph above) where extensive metallurgical examination of radioactive materials can be carried out. An elaborate hot-cell facility is a central requirement in many areas of radiation damage research, and would not otherwise be available to M.I.T. students; at present only the large industrial and government laboratories can afford such facilities.

A second M.I.T. project in radiation studies involves construction of a cryogenic facility to provide two new experimental capabilities at the Institute's nuclear reactor. One part of the cryogenic system will permit intense irradiation of solid samples kept in a bath of liquid helium, near 4° Kelvin. The other part of this facility consists of a moderator assembly refrigerated by cold helium gas, which will serve as a source of very slow neutrons for several experimental programs. The M.I.T. cryogenic system will come into operation in the next few months. The Atomic Energy Commission provided the refrigeration plant, while the National Science Foundation and the Sloan Fund for Basic Research gave financial support for constructing the facility, which is not duplicated at any other laboratory in the world.

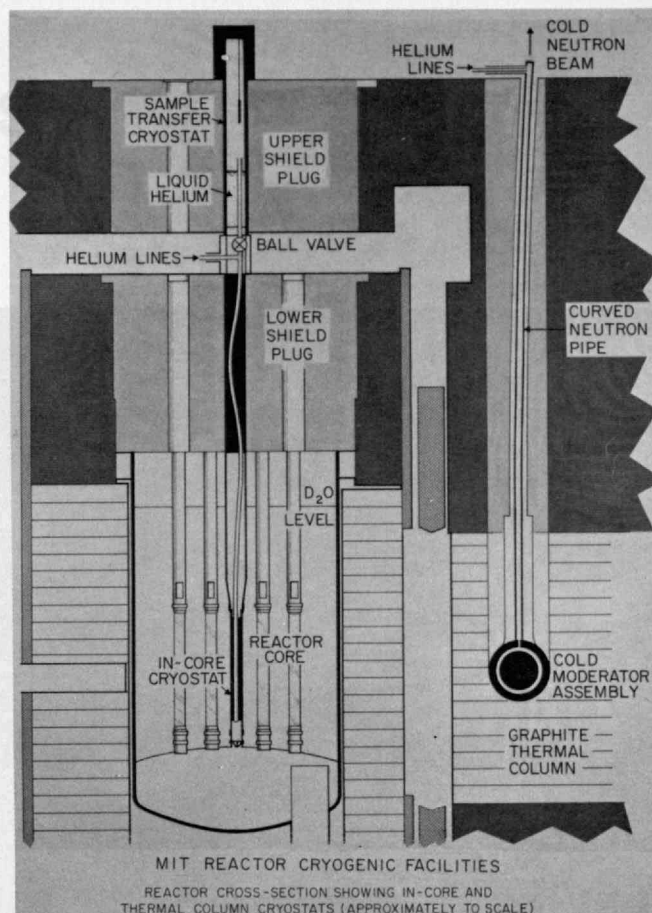
The figure opposite shows a schematic arrangement of the reactor cryogenic assemblies. A long tube which extends down from the top of the reactor supplies liquid helium to refrigerate samples undergoing irradiation in the center of a core fuel element. The transfer cryostat at the top of the tube permits the insertion or removal of sam-

ples with the reactor at power, the samples being kept in liquid helium while they are transferred to the laboratory for study. The importance of this provision and the interest in conducting low-temperature irradiations can be appreciated from my brief discussion of radiation damage theory. If a sample is sufficiently cold when exposed to energetic radiation, the atoms are essentially frozen into position in the crystal lattice. Hence, experimenters can examine the damage produced directly by the bombarding particles. From experiments reported by several laboratories, it is evident that significant thermal annealing in many solids occurs in a matter of a few minutes at 40° Kelvin and in some metals at temperatures as low as 5° Kelvin. Consequently, it is necessary to irradiate and examine samples at temperatures near absolute zero to be certain of preventing thermal annealing; liquid helium at its atmospheric boiling point of 4.2° Kelvin offers a practical medium in which to carry out such experiments.

The second cryogenic chamber in the schematic illustration is a cold moderator assembly. This is simply a sphere of an effective neutron moderator, such as beryllium, which is refrigerated to about 20° Kelvin with cold helium gas. The moderator brings the neutron energies down to thermal equilibrium with the assembly, producing slow, or "cold," neutrons. Reducing the neutron energy, which increases the neutron wavelength, makes it possible to "pipe" the slow neutrons out of the reactor by reflecting them down the walls of a suitably shaped tube. The physical arrangement of the M.I.T. reactor will ultimately permit us to install four such ports; each beam will be many times more intense than beams extracted from the usual ports, which are simply open holes extending toward the reactor core.

We anticipate other benefits from providing cold neutron beams. The neutron energies may be adjusted to the wavelength at which neutron crystal spectrometers are most efficient, thus increasing the beam intensity available for various diffraction experiments. These include measurements of fundamental properties of the neutron, elastic scattering for structural studies and interaction effects, and inelastic scattering to investigate internal vibrations of molecules and atomic motions in condensed solids. The cold neutron facility may also assist the current efforts by Professor Shull at M.I.T. and Professor Ramsey at Harvard to determine whether or not there is an electric dipole moment in the neutron. Their experiments are profoundly significant in our understanding of the nature of this fundamental particle, and the precision of the measurements may be increased by providing a more intense source of long wavelength neutrons.

Schematic view of the M.I.T. reactor containing recently added cryogenic assemblies. The transfer cryostat (top left) allows samples maintained in liquid helium to be inserted or removed while the reactor is at power. The assembly at right produces slow, or cold, neutrons, which can be efficiently channeled into beams emerging from the reactor.



To me, a most exciting prospect is the marriage of the cold neutron experiments with radiation damage research, bringing both parts of the cryogenic facility to focus on the same problem. Cold neutron scattering measurements can be used to examine defects in solids which are on the size scale expected from neutron damage, but little has been done to exploit this technique because sufficiently strong beams of long wavelength neutrons have not been available. We expect that the cold neutron facility at the M.I.T. reactor will remove that obstacle and will contribute strongly, along with the planned low-temperature irradiations, to an understanding of radiation effects and to our further exploration into the microscopic structure of engineering materials.

Dr. Ziebold is Associate Professor of Nuclear Materials at M.I.T. He graduated from Yale in 1956, and received his master's degree and his doctorate from M.I.T. in 1963 and 1965. Before coming to M.I.T. Dr. Ziebold served in the U.S. Naval Reserve and worked as a nuclear materials engineer for Neutron Products, Inc., of which he is now a director.

Drilling and production platforms stretch to the horizon on Lake Maracaibo, Venezuela. The waters of the lake, up to 120 feet in depth, now contain more than 5000 platforms. Although their design and construction represented an important achievement in the pioneering days of offshore oil exploration, most of their technology cannot be adapted to the much more severe conditions oilmen encounter in ocean locations.



Technological improvements in detecting and exploiting oil from beneath the oceans promise to increase its contribution to the world's fuel reserves

Richard J. Howe, S.M.'65

Oil from the Oceans

Thick sediments with good petroleum potential lie beneath a third of the world's continental shelves—an area greater than that of the continental United States. During the past 20 years the petroleum industry has developed the technology to drill and produce oil and gas wells in these undersea locations. Continuing improvements in the technology and soaring optimism within the industry suggest that offshore oil and gas will supply an increasing proportion of our fuel needs in the coming decade.

At present oil companies are conducting exploration and production operations in ocean waters adjacent to more than 70 countries. Twenty-one of these countries now produce a total of more than four million barrels of offshore oil per day—16 per cent of the Free World's total. In addition, 6 per cent of the world's natural gas production comes from underwater areas. Both these percentages are likely to increase substantially in the future.

Exploratory wells have been drilled in 635 feet of water; shallow core holes have been drilled in 5,000 feet of water; giant production platforms have been built in water 340 feet deep; and subsea pipelines have been installed to transport offshore oil and gas from these platforms to market.

In a recent lease sale in the Santa Barbara Channel, leases were granted in water depths ranging up to 1800 feet; clearly, many existing depth records are expected to fall in the next few years. To date, the oil industry has spent \$10 billion to develop offshore petroleum reserves, and in the next 10 years it will spend an amount estimated at two and a half times that figure.

Earliest Efforts

Production of oil from fields lying under the ocean dates back to before the turn of the century, when wells in California were drilled out under the sea from rigs located on land or piers adjacent to the beach. In the 1920's, wells were drilled in Lake

Maracaibo, Venezuela, from timber platforms in shallow water, and in the next decade, when the search for underwater oil centered on the marshes of Louisiana, the industry developed the inland barge-type drilling rig, which is a rectangular barge designed to support drilling equipment.

Extensive discoveries of oil and gas in the coastal marshes during the 1930's convinced petroleum geologists that similar hydrocarbon accumulations would be present under the open waters of the Gulf of Mexico. However, not until after World War II did the necessary economic incentives and technological skill become available to follow up the geologists' hunches. Then, in 1948, the first deep-water drilling and production platform went up in the Gulf of Mexico. This platform, supported in 50 feet of water by more than 100 steel piles that extend some 200 feet into the ocean floor, was designed to support the equipment necessary to drill the wells and house a crew of 50 men. Fortunately the drillers struck oil, and the million-dollar structure remains in operation today.

At the time this first platform was built, very little was known about the forces that hurricane waves exert on fixed structures. The design of this and other early platforms was based on wave force data gathered in wave tanks located at M.I.T., Stevens Institute of Technology, and the David Taylor Model Basin in Washington. Since no reliable measurements were available, leading oceanographers estimated storm tides, storm currents, and wave crest elevations. Other items such as wind forces and piling capacities were based on conventional land construction experience. Since that time, petroleum companies have sponsored a number of research projects to measure wave profiles and wave forces during hurricanes; this work has led to a much better understanding of the forces which act on offshore structures. In the Gulf of Mexico, modern structures are designed to withstand winds up to 140 m.p.h. and waves measuring up to 60 feet in height, depending on water depth and location.

Toward the Mobile Drilling Rig

Following construction of the first offshore platform in 1948, the companies realized that some less expensive method for locating commercial oil and gas reservoirs would have to be developed, since only a small percentage of wildcat wells find such reservoirs. One answer was to use a very small platform to support the drilling rig and carry most of the heavy equipment on a ship anchored next to the platform. This approach was quite successful, and 35 drilling tender barges were placed in operation during the 1950's.

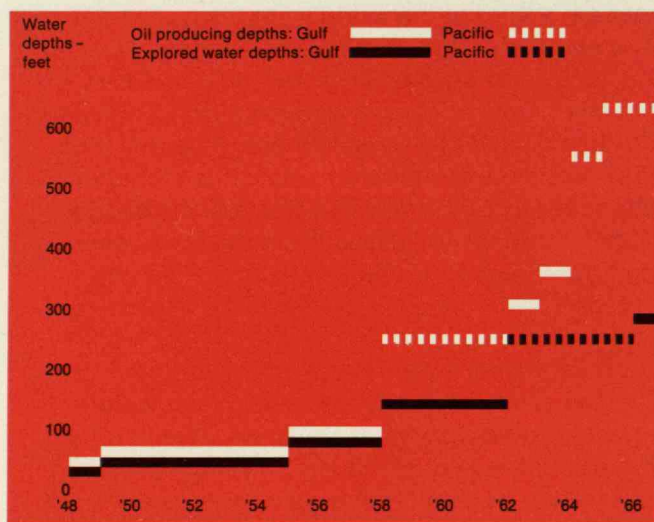
In many cases, even the tender-type platform proved too expensive for exploratory drilling, and the offshore mobile drilling rig also became popular in the 1950's. This rig is a self-contained, portable unit which can be moved intact from one drilling location to another. The 180 mobile rigs now in use represent an investment of approximately \$1 billion, and they have been instrumental in the rapid worldwide expansion of offshore drilling operations. Their mobility has permitted journeys from the United States to such distant locations as the Persian Gulf, Australia, Nigeria, and the North Sea. Four major types of mobile units have evolved—submersible barges, self-elevating platforms, ships, and semisubmersible barges.

The submersible barge rigs are a direct extension of the early inland drilling barges in that they maintain a fixed distance between their drilling deck and the support hull, which floats the rig from location to location. The first mobile rig was a submersible barge capable of drilling wells in 20 feet of water. The largest rig in this class is a \$6 million giant which can drill 20,000-foot wells in 175 feet of water; 30 submersible barges are now in operation.

The self-elevating, or jack-up, mobile rig has become the most popular type, with some 90 in operation today. These rigs have a single hull member which is lifted out of the water when the rig reaches the drilling location. Various combinations of pneumatic, hydraulic, and electric jacking devices control the legs. Several of these rigs are designed to drill in water as deep as 300 feet: the legs for one such rig are 460 feet tall and weigh 850 tons each! In the drilling position, the distance from the sea floor to the top of the drilling derrick is greater than the height of the Washington Monument.

During the mid-1950's, eleven small World War II surplus vessels were used to drill core holes off the coast of California in water depths ranging up to 600 feet. In 1961, one of these vessels was used to drill shallow core holes in 3,000 and 11,700 feet of water during the first phase of the recently cancelled Project Mohole (see Technology Review,

Dramatic increases in drilling and production depth records off the United States coastline have followed technological advances in drilling. The increases in depths of exploratory drilling resulted directly from the application of special subsea equipment for drilling exploratory wells from floating vessels in the late 1950's. In the near future floating or underwater production systems may come into use, as oil production depths follow the trend of exploration wells.



Nov., 1966, p. 5). Since these depths were beyond the capability of conventional mooring systems, four large outboard propeller drives were added to enable the ship to maintain position over the core hole. Several ships of this type are currently being used to obtain shallow cores in the Gulf of Mexico and off the Atlantic seaboard. The ship obtains its position with respect to the core hole by using a small wire stretched between the ship and a weight on the ocean floor. Small changes in the angle of this wire, together with signals from a gyrocompass, are fed into a computer that directs the propulsion system to bring the vessel back over the hole while maintaining a fixed heading.

In the late 1950's, special subsea equipment was developed for drilling full-scale exploratory wells from floating vessels. As a result, the water depth record for exploratory drilling has increased from 250 to 632 feet during the past five years. A number of large ships has been converted for drilling service and others have been built from the keel up to contractors' specifications. The largest drilling vessel in service today is a converted Norwegian whaler which measures 635 feet by 77 feet and displaces 33,000 tons. Approximately 40 drilling ships are operating today throughout the world.

Another important development in drilling vessels was the semisubmersible barge rig, which became popular in the early 1960's. This is a submersible rig anchored in a partially submerged position. The rigs use more or less the same mooring systems and subsea equipment as the ships, but generally have more deck space and are more transparent to wave action. In 1964 one such vessel weathered the full force of Hurricane Hilda, even though its mooring failed in the 50-foot waves. The 20 semisubmersible rigs in operation today are giant pieces of equipment often measuring 300 feet on a side and displacing up to 20,000 tons in the drilling position. They cost up to \$10 million—or can be rented for \$10 a minute.

Any pioneering venture such as this will suffer some accidents, and offshore operations have been no exception. There has been a series of 27 mobile unit accidents where the rig was lost or the damage exceeded one million dollars. Half of these accidents occurred while the rig was being moved, the balance being about equally divided between fires and severe storms. Improved operating procedures have reduced major accidents to a total of only three since 1965. Increasing knowledge of the forces which act on offshore structures plus the experience being gained by offshore operators should reduce accident rates even further.

Exploration and Exploitation

Coupled with the great strides made in offshore drilling equipment during the past 20 years, similar improvements have been achieved in the offshore seismic techniques used to locate subsurface geological structures which may contain oil or gas. At present, offshore seismic surveys cost perhaps a third as much as land surveys, because the marine environment is ideally suited to rapid data gathering. A typical system consists of a boat which travels at five knots and tows a cable or streamer containing 24 equally spaced groups of sound detectors. This streamer, which is a mile or more in length, remains submerged approximately 30 feet. At one-minute intervals, an energy source of some type is detonated; the detectors measure reflections of acoustic energy from the various subsurface horizons. The information is recorded on tape for future analysis at large data processing centers on shore. Recent improvements, such as digital data recording and processing, continue to increase the quality of marine seismic data.

Once an exploratory well, located through the use of seismic data, has confirmed gas or oil in commercial quantities, the oil company swings into full development of the field. In most cases the company erects a large platform over the center of the reservoir and uses directional drilling techniques to reach reservoir locations more than a mile in hori-

zontal distance from the platform. If the reservoir is particularly large or strangely shaped, however, multiple platforms may be required. These platforms are designed to support, in addition to the drilling rig, equipment for separating oil, water and gas, the living quarters for personnel operating the platform, the gas compressors or pumps for moving the production to shore, and all the equipment for controlling the individual wells.

As operations have moved into deeper and deeper water, the size and cost of production platforms have soared. An 18-well platform for 300 feet of water, for example, could cost as much as \$3 million. This platform would contain some 5,500 tons of steel—3,000 tons for the jacket or driving template, 1,800 tons for the piling, and 700 tons for the deck sections. Since even the largest derrick barges are limited to a capacity of 800 tons, the jackets are usually launched from a transport barge when they reach the construction site. Derrick barges, costing \$15,000-\$50,000 per day, then set the jacket in a vertical position, drive the piling, and set the deck sections in place. This operation takes anything from a week to a month, depending on the weather.

Another technique for installing jackets has been developed for use in remote locations where derrick barges are not available or where their use is impractical. The caisson-type jacket has large cylindrical legs (15-25 feet in diameter) which permit it to be towed to the location in a horizontal position. On site the legs are flooded in a certain sequence, rotating the jacket to a vertical position from which it is sunk to the bottom. Multiple piles are driven through the legs to hold the platform in place. In such designs, the wells are drilled through the piles.

As offshore operations have expanded into new areas, engineers have encountered a number of challenging problems. One of the most interesting has been the design of platforms in the Cook Inlet of Alaska. These platforms must withstand forces exerted by ice floes up to four feet thick, which float into and out of the Inlet with the eight-knot currents caused by the 30-foot tides in that area. To overcome the ice forces, engineers built an extra-heavy caisson-type platform using special low-temperature steels. Platforms of this type cost \$8 to \$12 million for only 100 feet of water. One unique design—called the Monopod—has only one 28-foot cylindrical member exposed to the ice forces.

Another example of the ingenuity used by offshore designers to meet specific requirements is the construction of artificial islands off the coast of California. The largest of these developments is the

East Wilmington field, part of which lies under the Pacific Ocean adjacent to Long Beach. Four man-made islands, 10 acres in area, have been built to develop the offshore portion of the field; each will contain between 130 and 215 wells, all of which will be completed below ground level in special concrete cellars. The wells will be drilled and serviced by specially designed electric rigs which have the appearance of high-rise apartment buildings. Palm trees and waterfalls create a "green belt" around the perimeter of the islands to enhance the appearance of the complex when viewed from the shore. Ultimately, the production from this billion-dollar project is expected to reach some two hundred thousand barrels of oil per day.

Moving Production below Sea Level

As the trend toward operations in deeper water has continued, several companies have developed technology and equipment to complete and maintain underwater wells. One application for this type of equipment arises when directional wells drilled from a single, deepwater platform cannot reach all parts of a reservoir. In this case, satellite underwater completions could be used for the peripheral wells. Underwater completions have also been used when wells are produced directly to shore, without using a production platform; several such installations exist off the coasts of California and Peru.

The heart of these systems is the underwater "christmas tree"—a series of pipes and valves used to control flow from the well. It is installed on the subsea landing base by a mobile rig after the drilling operations are completed. Although most of these underwater trees are designed to be installed remotely, divers must often lend a hand. Recently an experimental "robot" was built to perform a limited number of operations on a specially designed christmas tree.

Although the concept of a completely underwater oil field is quite popular in the technical press, the cost of such a facility will probably preclude its use for many years. At some water depth, however, it will become impractical to continue building bottom-founded production platforms, and at this point either a floating or underwater production system or some combination of the two will come into use.

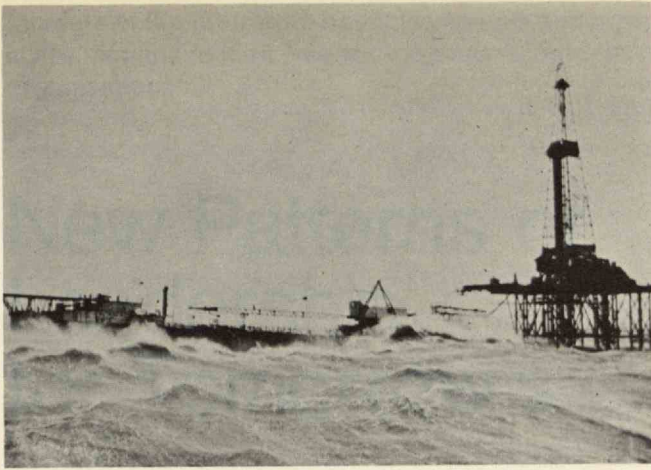
Divers have made a substantial contribution to the over-all success of offshore drilling operations. In shallow water, divers working with helmets and scuba gear have helped in such tasks as connecting flow lines and risers, locating existing pipelines, recovering lost equipment and inspecting underwater damage.

The movement of drilling operations into deeper water has called for more refined diving techniques. For example, in a recent platform salvage operation in 200 feet of water in the Gulf of Mexico, divers used saturation diving techniques to increase substantially the amount of work time they spent on the sea floor. The divers remained at a pressure of approximately 100 p.s.i. for periods up to seven days, using a special chamber located on the deck of a work barge for rest periods. A diving bell provided transportation to their work location at the bottom of the sea. Similar equipment is being used on a number of deepwater mobile rigs. Use of the bell to return divers to the rig at bottom pressures eliminates the slow ascent ordinarily required with stage decompression. One company recently sponsored a record-breaking dive in the Gulf of Mexico, during which a team of two divers performed a series of tasks on a simulated wellhead in 636 feet of water. It took seven days to decompress the divers following this test.

At the time an offshore operator is planning his production facilities, he also needs to decide how to transport the oil and gas to market. A pipeline to shore normally offers the best solution, and offshore contractors have developed methods of laying large-diameter pipelines in water depths up to 350 feet. Equipment aboard specially designed barges can weld, x-ray, prime, wrap, and concrete-coat the pipe as it is fed off the end of the barge. One novel pipelaying barge uses a large-diameter reel to handle several miles of pipe in a single piece, unreeling it at speeds up to one mile per hour; special rollers straighten the pipe as it comes off the reel. This technique appears to have application for laying lines up to 12 inches in diameter.

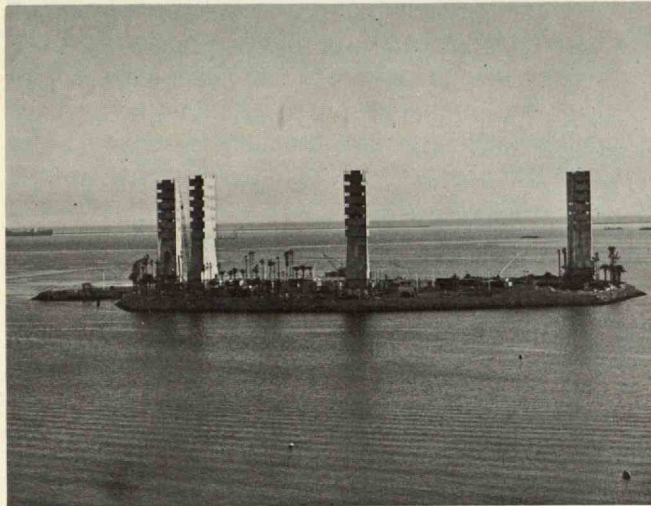
An estimated 5,000 miles of pipe, ranging in size from small-diameter flow lines to 26-inch trunk lines, now crisscross the sea floor in the Gulf of Mexico; large-diameter (up to 40-inch) lines have been installed in Lake Maracaibo and the Persian Gulf; and gas pipelines in the 16-20-inch range are currently being laid in the North Sea and Bass Straits of Australia to connect newly discovered fields in those areas with the mainland. The icy Cook Inlet has presented pipeliners with their toughest problems: installation costs in this area have reached \$300,000 per mile even for relatively small-diameter pipe.

When the investment for a pipeline becomes too high, an alternate solution is to store the oil on or near the production platform, and transport it to shore in barges at a later time. In shallow water, barges often provide both storage and transportation, while various portable tanks, similar to the submersible barge type of mobile rigs, have acted as temporary oil reservoirs in deeper waters. If pro-



Severe storms present designers of offshore oil rigs with their most stringent limitations (top). Photograph shows a drilling rig tender weathering a storm. Designers in the late 1940's relied on model tests and educated guesses for data on wave forces in storms; research projects and experience since then have yielded new understanding of forces acting on offshore structures. Modern rigs in the Gulf of Mexico can withstand winds up to 140 miles per hour and waves as high as 60 feet.

Artificial island off the coast of California contains oil wells in special cellars below ground level. The four structures on the island are electric rigs designed to look like high-rise apartments; palm trees and waterfalls are planned to enhance the appearance of the island from the shore.



Although income in recent years has been accelerating as a result of these heavy expenditures, cumulative net cash income from this area stands at \$3.5 billion, leaving the operators with a deficit of \$4 billion. In a recent analysis of expenditures and income from this area up to the year 2000, one expert estimated that the industry's discounted cash flow rate of return on this investment will be only 7 per cent. Depending on the rate of growth of reserves, the return could be as low as 4 per cent. These rates are certainly low when compared with the risks involved in operating offshore; however, the petroleum companies must take these risks to meet anticipated future demands for petroleum.

Looking back over this 20-year period, tremendous strides have been made in offshore technology. In 1948, the installation of a platform in 50 feet of water in the Gulf of Mexico was hailed as a major engineering achievement, as indeed it was; but today's platforms are being built in water seven times as deep on a more or less routine basis. The technology now exists to build fixed platforms in 600 feet of water and perhaps deeper. Equipment capable of drilling full-scale exploratory wells in water more than 1000 feet deep is also available, even though the economics of ultradeep production operations do not appear too favorable in most areas. In fact, the industry could probably design and build a completely underwater oil field in the next few years, although this does not yet look like the most economic way to proceed. Whichever direction the industry takes, the development of offshore petroleum resources to date represents one of the important engineering achievements of this century, and it offers many exciting developments during the next 10 years.

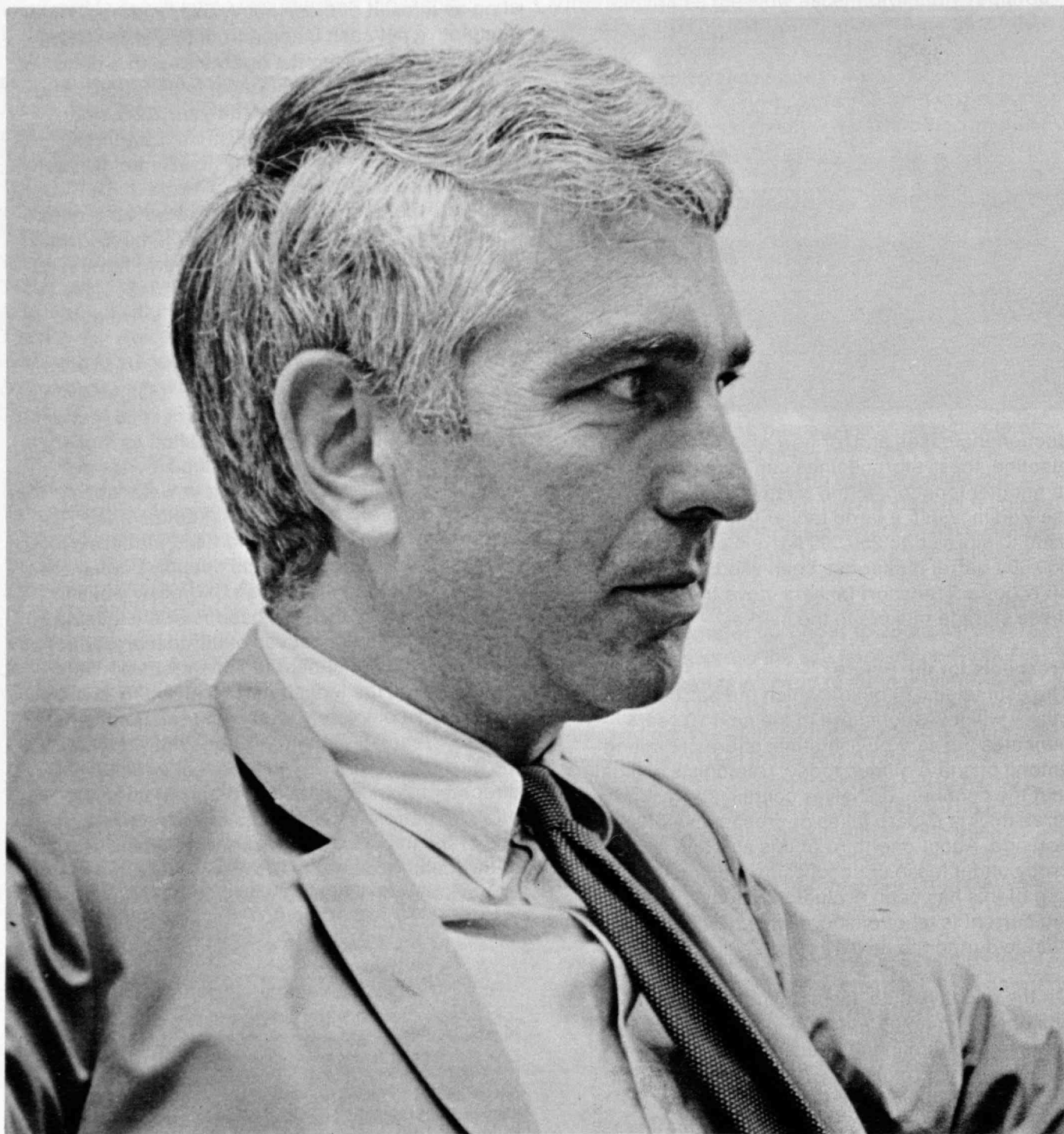
duction increases and/or new discoveries justify a pipeline, these storage units can then be moved to another location. In the relatively calm waters of the Persian Gulf, a large tanker hulk has been used to store up to 250,000 barrels of crude, and a 360,000-barrel tanker has been used to store oil off Nigeria. Transport tankers move the oil from these storage tankers to the market.

Prospects for the Future

The estimated \$25 billion which the petroleum industry will invest offshore in the next 10 years indicates the very bullish atmosphere prevailing among offshore oilmen today. Geologists estimate that the continental shelves contain approximately three million square miles of prospective offshore acreage. About one-third of this acreage is currently under lease or concession, and only a fraction of this has been evaluated. Thus it appears that the current level of offshore activity will more than double during the next 10 years.

On the negative side, most offshore operators are still operating in the red. The industry's total investment to date in the Louisiana offshore area amounts to approximately \$7.5 billion, including more than \$2 billion in payments to the state of Louisiana and the federal government for leases.

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New Patterns of Leadership for Tomorrow's Organizations

Two years ago, I forecast that in the next 25 to 50 years we would participate in the end of bureaucracy as we know it and in the rise of new social systems better suited to the Twentieth Century demands of industrialization (see *Technology Review*, Apr., 1966, pp. 36 ff.). This forecast was based on the evolutionary principle that every age develops an organizational form appropriate to its genius and that the prevailing form today—the pyramidal, centralized, functionally specialized, impersonal mechanism known as *bureaucracy*—is out of joint with contemporary realities.

This breakdown of a venerable form of organization so appropriate to Nineteenth Century conditions is caused, I argued, by a number of factors, but chiefly the following four:

1. Rapid and unexpected change.
2. Growth in size where the volume of an organization's traditional product is not enough to sustain growth.
3. Complexity of modern technology, where integration between activities and persons of very diverse, highly specialized competence is required.
4. The psychological threat springing from a change in managerial values toward more humanistic, democratic practices.

Organizations of the future, I predicted, would have some unique characteristics. The key word will be "temporary." There will be adaptive, rapidly changing *temporary systems*. Organization charts will consist of project groups rather than stratified functional groups, which now is the case. Adaptive, problem-solving, temporary systems of diverse specialists, linked together by co-ordinating executives in organic flux—this is the organizational form that will gradually replace bureaucracy.

Ironically, the bold future I was predicting two years ago is now a mundane reality; It can be observed today where the most interesting and advanced practices exist. We live in a time and place where rapid social and technological change is

endemic, and so perhaps it should not be too surprising that a distant future can invade overnight, so to speak—certainly before the forecast is fully comprehended.

New Styles and Tasks of Leadership

The question of the leadership of these new-style organizations was left unanswered in the original article. Are there any guidelines transferable to their management from present managerial practices? Do the behavioral sciences provide any suggestions for leaders of the future? How can these complex, ever-changing, free-form, kaleidoscopic patterns be co-ordinated? There can be no definitive answers to these questions until the future emerges in a more or less unambiguous way. But we clearly need to attempt an evaluation of the leadership requirements for organizations of the future, for without the effort we shall inevitably back into the future instead of managing it effectively.

Developing Rewarding Human Systems

The general direction of these organizational changes—toward more service and professional organizations, toward more educated, younger, and mobile employees, toward more diverse, complex, science-based systems, toward a more turbulent and uncertain environment—forces us to consider new styles of leadership. Leading the enterprise of the future will become a significant social process, requiring as much interpersonal competence as substantive competence, if not more.

One convenient focus for a discussion of leadership is to summarize the main problems confronting modern organizations and to understand the kinds of tasks and strategies linked to the solution of these problems. These are summarized in the chart on the next to last page of the article which also shows some possible executive steps.

A simple way to understand the problem of integration is to compute the ratio between what an

individual gives and what he receives in his day-to-day transactions. In organizational terms, we can ask: Are the *contributions* to the organization about equivalent to the *inducements* received? There is nothing startling or new about this formulation. What is interesting is that organizations frequently do not know what is truly rewarding. This is particularly true in the case of the professionals and highly trained workers who will dominate the organizations of the future, with whom conventional policies and practices regarding incentives—never particularly sensitive—tend to be inappropriate.

Most organizations regard economic rewards as the primary incentive to peak performance. These are not unimportant to the professional, but—provided economic rewards are equitable—other incentives become far more potent. Professionals tend to seek such rewards as full utilization of their talent and training; professional status (not necessarily within the organization, but externally with respect to their profession); and opportunities for development and further learning. The “good place to work” resembles a super-graduate school, alive with dialogue and senior colleagues, where the employee will work not only to satisfy organizational demands but, perhaps primarily, to fulfill self-imposed demands of his profession.

How (or even *if*) these needs can be deliberately controlled by the leadership is not at all clear. Company-sponsored courses, T-groups, and other so-called adult education courses may contribute. The idea that education has a terminal point is clearly old-fashioned. A “drop-out” may soon be redefined to mean anyone who has not *returned* to school.

However the problem of professional and personal growth is resolved, it is clear that many of the older forms of incentives will have to be reconstituted. Even more profound will be the blurring of the boundaries between work and play, between affiliative and achievement drives which Nineteenth Century necessities and mores have unsuccessfully attempted to compartmentalize.

Developing Executive Collaboration

It is quaint to think that one man, no matter how omniscient and omnipotent, can comprehend, to say nothing of control, the diversity and complexity of the modern organization. Followers and leaders who think this is possible are entrapped in a false dream, a child's fantasy of absolute power and absolute dependence. As a result, there has been a tendency to move away (tacitly) from a “presidential” form of power to a “cabinet” or team concept. Such a system of an “executive

constellation” by no means implies an abdication of responsibility by the chief executive. It is a way of multiplying executive power through a realistic allocation of effort. Despite all the problems inherent in the executive constellation concept—the difficulties of building an effective team, of achieving compatibility, etc.—it is hard to see other valid solutions to the constraints of magnitude and sheer overload of the leader's role.

Not unrelated to the problem of developing an effective executive constellation is another key task of the leader—building a collaborative climate. An effective collaborative climate is easier to experience and harder to achieve than a formal description, but most students of group behavior would agree that it should include the following ingredients: flexible and adaptive structure; utilization of member's talents; clear and agreed-upon goals; norms of openness, trust, and cooperation; interdependence; high intrinsic rewards; and transactional controls—i.e., members of the unit should have a high degree of autonomy and a high degree of participation in making key decisions.

Developing this group “synergy” is difficult. Lack of experience and strong cultural biases against group efforts worsen the problem. Groups, like other highly complicated organisms, need interaction, trust, communication, and commitment, and these ingredients require a period of gestation. But expensive and time-consuming as it is, building synergetic and collaborative cultures will become essential. Modern problems, too complex and diversified for one man or one discipline, require a blending of skills and perspectives, and only effective problem-solving units will be able to master them.

Identification with the Adaptive Process

Man's accommodation to change is generally painful, but characteristically and ironically he continues to seek out new inventions which disorder his serenity and undermine his competence. One striking index of the rapidity of modern change—for me, the most dramatic single index—is the shrinking interval between the time of a discovery and its commercial application. The transistor was discovered in 1948; by 1960 over 50 per cent of *all* electronic equipment utilized transistors in place of conventional vacuum tubes.

The increasing tempo of discovery and its application make modern organizations acutely dependent on their success in responding flexibly and appropriately to new information. How can the leadership create an atmosphere of continuity and stability in this environment of change? Whitehead put the problem well when he said, “The art

of society consists first in the maintenance of the symbolic code, and secondly, in the fearlessness of revision . . . Those societies which cannot combine reverence to their symbols with freedom of revision must ultimately decay . . ."

There is no easy solution to the tension between stability and change. We are not yet an emotionally adaptive society, though a remarkable aspect of our generation is its commitment to change in thought and action. Executive leadership must take some responsibility in creating a climate that provides the security to identify with the adaptive process without fear of losing status and its psychological companion, a lowered self-esteem. Creating an environment that increases a tolerance for ambiguity and where one can make a virtue out of contingency, in contrast to an environment which induces hesitancy and its reckless counterpart, expedience, is one of the most challenging tasks for the new leadership.

Supra-Organizational Goals and Commitments

The new organizations we speak of, with their bands of "pseudo-species" coping within a turbulent environment, are particularly allergic to problems of identity. Professional and regional orientations lead frequently to fragmentation, inter-group conflicts and power plays and rigid compartmentalization devoid of any unifying sense of purpose or mission.

The university is a wondrous place for the development of advanced battle techniques between groups which far overshadow their business counterparts in subterfuge and sabotage. Quite often a university becomes a loose collection of competing departments, schools, institutes, committees, centers, and programs, largely noncommunicating because of the multiplicity of specialist jargons and interests and held together, as Robert Hutchins once said, chiefly by a central heating system. Having heard variations of this theme over the years, a number of faculty and administrators at one large university, who thought they could "wear the over-all university hat," formed what later came to be known as "the HATS group." They came from many departments and hierarchical levels, represented a rough microcosm of the entire university, and have become a prototype through the important role they have played in influencing university policy.

There are a number of functions that leadership can perform in addition to encouraging HATS groups. It can identify and support those individuals who can serve as articulating points between various groups and departments. There are many individuals who have a bi-cultural facility, a capacity for psychological and intellectual affinity with

different languages and cultures, who can provide articulation between seemingly inimical interests, who can break down the pseudo-species, transcend vested interests, regional ties and professional biases. Leadership can seek out and encourage these people. It can work at the interfaces of the pseudo-species, setting up new programs in the interstitial areas, in order to create more inter-group articulations. This is precisely what Mary Parker Follett had in mind when she discussed leadership in terms of an ability to bring about a "creative synthesis" between differing codes of conduct. Chester Barnard in his classic *Functions of the Executive* recognized this, and he also recognized the cost in personal energy of this kind of synthesis. He wrote, "It seems to me that the struggle to maintain cooperation among men should as surely destroy some men morally as battle destroys some physically."

Revitalization: Controlling Destiny

The issue of revitalization—the organization's taking conscious responsibility for its own evolution—confronts the leader with the penultimate challenge: growth or decay. His urgent problem is to develop a climate of inquiry and enough psychological and employment security for continual re-assessment and renewal. The organizational culture must encourage individuals to participate in social evolution against unknown, uncertain, and implacable forces and to collect valid data and act on limited information without fear of losing control.

The three-step "action-research" model of data-generation, feedback, and action-planning sounds deceptively simple. In fact, it is difficult. Quite often the important data cannot be collected by the leader. Even when the data are known, there are many organizational short circuits and "dithering devices" which distort and prevent the data from reaching the right places at the right time. And even when data-generation and feedback are satisfactorily completed, organizational inhibitions may not lead to implementation. But some progressive organizations are setting up organizational development departments that attempt to reduce the "implementation gap" between information, new ideas and action. These departments become the center for the entire strategic side of the organization, including not only long-run planning but plans for gaining participation and commitment to the plans. This last step is the most crucial for the guarantee of successful implementation.

New Concepts for Leadership

In addition to substantive competence and comprehension of both social and technical systems, the new leader will have to possess interpersonal

skills, not the least of which is the ability to defer his own immediate desires and gratifications in order to cultivate the talents of others. Just as salesmen are admonished that "you gotta know the territory," so too the manager must be at home in the "social territory," the complex and dynamic interaction of individuals, roles, groups, and organizational and cultural systems.

Leadership is as much craft as science. Analytical methods, drawn primarily from social psychology and sociology, suffice for business leaders to understand the scientific aspects of their profession, but the main instrument or "tool" for the leader-as-a-craftsman is *himself* and how creatively he can use his own personality. Leaders, like physicians, are "iatrogenic"—that is, capable of spreading as well as curing disease. Unless the leader understands his actions and their effects on others, he may be a "carrier" rather than a solver of problems. Thus he must be willing and able to set up reliable mechanisms of feedback so that he can conceptualize the "social territory" of which he is an important part—and at the same time realize how he influences it.

Another aspect of the "social territory" that has key significance for leadership is the idea of *system*. At least two decades of research have been making this point unsuccessfully. Research has shown that productivity can be modified by group norms, that training effects deteriorate if the training is not compatible with the goals of the social system, that group cohesiveness is a powerful motivator, that inter-group conflict is a major problem facing organizations, that individuals take many of their cues and derive a good deal of their satisfaction from their primary work group, that identification with the small work group turns out to be the only stable predictor of productivity, and so on.

This evidence is often cited and rarely acted upon. It seems that individuals, living amidst complex and subtle organizational conditions, tend to oversimplify and distort complex realities so that "people" rather than conditions embody the problem. This tendency toward personalization can be observed in many situations. We can see it in distorted polarizations such as the "good guy" leader and his "hatchet man" assistant. It is easier to blame heroes and villains than the system. For if the problems are embroidered into the fabric of the system, complex as it is, the system can be changed. But it is hard to change people.

"Other-Directed" Leadership

One famous typology in the social sciences was introduced by David Riesman in his book, *The Lonely Crowd*. He asserted that contemporary man

is more "other-directed" than his father—or certainly than his grandfather, who would have been characterized as "inner-directed." These character types refer essentially to the ways individuals are influenced and the forces which shape their perspectives. "Other-directed" man takes his cues from his peer group rather than from his parents; in other words, he takes his relationships more seriously than he does his relatives. His ideology, values, and norms are transmitted to him and accepted by the particular social group with which he associates. He is a "pleaser," co-operative and accommodating. "Inner-directed" man, to extend an exaggeration, responds to some internal gyroscope, typically internalized parental pressures. He responds not to any social grouping but to some inner cues, shadowed reflections of his parents' dictates. "Inner-directed" man is rigid, unyielding, and acts on principles. Studies conducted in industrial settings have consistently shown that organizations tend to reward the aggressive, forceful, decisive "inner-directed" leader rather than the co-operative, adaptable, "other-directed" leader. Now a new study of the leadership in service-oriented organizations by E. E. Lawlor and L. W. Porter shows that "other-directed" leaders tend to be more highly rewarded in this setting than "inner-directed" leaders. In the service-oriented growth industries of education, health, welfare, government, and professional organizations, the prime requisites of a leader are interpersonal competence and "other-directedness."

An Agricultural Model of Leadership

I have not found the right word or phrase that accurately portrays the concept of future leadership I have in mind. The most appropriate metaphor I have found to characterize adaptive leadership is an "agricultural" model: The leader's job is to build a climate where growth and development are culturally induced, conditions where people and ideas and resources can be seeded, cultivated, and integrated to optimum effectiveness and growth. Roy Ash, an astute industrialist who is Chairman of Litton Industries, remarked recently: "If the larger corporations, classically viewed as efficient machines rather than hothouses for fomenting innovation, can become both of these at once, industrial competition will have taken on new dimensions." I think Ash captures exactly the shift in metaphor I am getting at, from a mechanical model to an organic one.

Up until very recent times, the metaphor most commonly used to describe power and leadership in organizations derived from Helmholtz's laws of mechanics, and the language reflects this derivation: social engineering, equilibrium, friction, and resistance are typical of the words we use.

Modern organizations are confronted with a series of circumstances and problems which have no true counterparts in corporate history, and these needs require new strategies and impose new tasks upon modern corporate leadership. The chart attempts to list the new problems, and their consequences, in grossly oversimplified form.

Problem	Tasks of the Leader
Integration The problem of integrating individual needs and organizational goals	Developing rewarding human systems
Social Influence The problem of distributing power	Developing executive constellations
Collaboration The problem of producing mechanisms for the control of conflict	Building a collaborative climate
Adaptation The problem of responding to a turbulent, uncertain environment	Identification with the adaptive process
Identity The problem of clarity, commitment, and consensus to organizational goals	Developing supra-organizational goals
Revitalization The problem of growth and decay	Organizational "self-renewal"

The vocabulary for adaptive organizations requires an organic metaphor, a description of *process*—not of structural arrangements. This description must include such terms as open, dynamic systems, developmental, organic, and adaptive.

The key aspect of the process insofar as leadership is concerned is the ability of the leader to develop a collaborative relationship with his subordinates. This is not to say that the leader should be a "good guy" or seek popularity, but it does mean that he will have to learn to negotiate and collaborate with his associates. Because the leader cannot know everything, his subordinates will have the information and competencies that the leader needs; his access to this information will depend entirely on his ability to collaborate with his employees and colleagues. While Marx argued that power accrues to the man with property, we argue that power accrues to the man who can

gather and control information wisely. The psychological "contract," if we may use that term, between leader and led is more satisfying and almost always more productive if the relationship is based on collaboration. Studies of scientists and engineers, for example, show that no unilateral conditions, where scientists decide for themselves or where the director decides for them, ever matched the quality of work under a collaborative relationship where research and development decisions were reached through a collaborative process.

Toward a New Leadership Style

All of these strategic and practical considerations lead to a totally new concept of leadership, the pivotal aspect of which is that the leader depends less on substantive knowledge about a particular topic than on the understanding and possession of skills summarized under the agricultural model.

The role of the leader has become infinitely more complex, for he is now at the center of a highly variegated set of pressures and roles. He presides over a complex establishment; his job is to co-ordinate, transact, motivate, and integrate. Simply, he must have the knowledge and competence to produce environments where the most able people can realize their talents, co-ordinate their efforts, remain committed to organizational goals, and integrate their efforts in a manner that no one of them working alone could surpass. Perhaps the most difficult aspect of this style of leadership is to transact (and confront) those recalcitrant parts of the system that are retarded, stunted, or afraid to grow. This will require enormous energy, saintly patience, and a sophisticated optimism in growth (or a high tolerance for disenchantment).

This new concept of leadership embraces five important sets of competencies:

1. Knowledge of large, complex systems, their dynamics and their "tribal customs."
2. Practical theories of intervening and guiding these systems, theories that encompass methods for seeding, nurturing, and integrating individuals and groups.
3. Interpersonal competence. This includes at least three components: (a) the sensitivity to understand the effects of one's own behavior on others and how one's own personality shapes his particular leadership style and value system; (b) a capacity to develop adequate methods for valid feedback; and (c) managing conflict. (There was a time when

I believed that consensus was a valid operating procedure. I no longer think this is realistic given the scale and diversity of organizations. In fact, I've come to think that the quest for consensus, except in pre-literate face-to-face cultures where it may be feasible, is a misplaced nostalgia for a folk-society as chimerical, incidentally, as the American adolescent search for "identity.")

4. A set of values and competencies which enables one to know when to confront and attack, if necessary, and when to support and provide the psychological safety so necessary for growth.

5. An ability to develop and use all types of information systems, including high-speed electronic computers. The job of the leader will be to collect, organize, and transmit information.

The role of leadership described here is clearly more demanding and formidable than any historical precedent, including both king and pope. Let us hope that this new role of leadership is not only more potent but also more gratifying.

Warren G. Bennis, Ph.D. '55, is Provost of the Faculty of Social Sciences and Administration at the State University of New York at Buffalo. This paper on "New Patterns of Leadership" is a sequel to his article on "Changing Organizations" published in *Technology Review* for April, 1966, when Dr. Bennis was Professor of Management and Organizational Psychology at M.I.T. "New Patterns of Leadership" is adapted from a chapter in *The Temporary Society* by Warren G. Bennis and Philip Slater, to be published this spring by Harper and Row, Publishers, by whose permission it appears in *Technology Review*.

Note:

Special reprints of Warren Bennis' earlier essay on "Changing Organizations," (Apr. 1966) to which this paper is a sequel, and of the essay above, have been arranged for *Technology Review* readers. For copies, mail this note with \$1 for the set of two reprints to:

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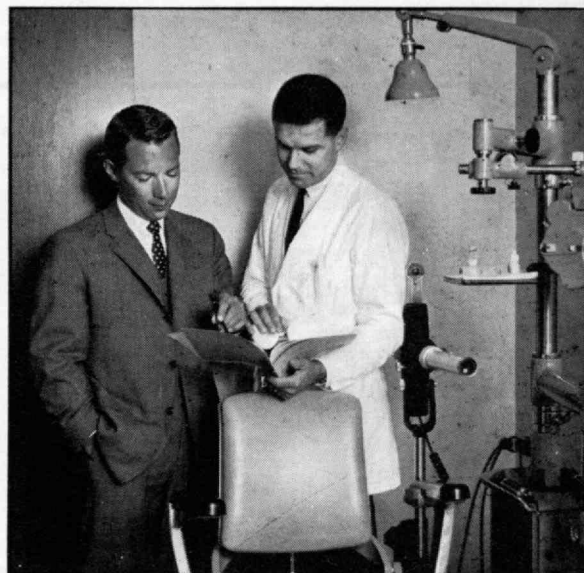
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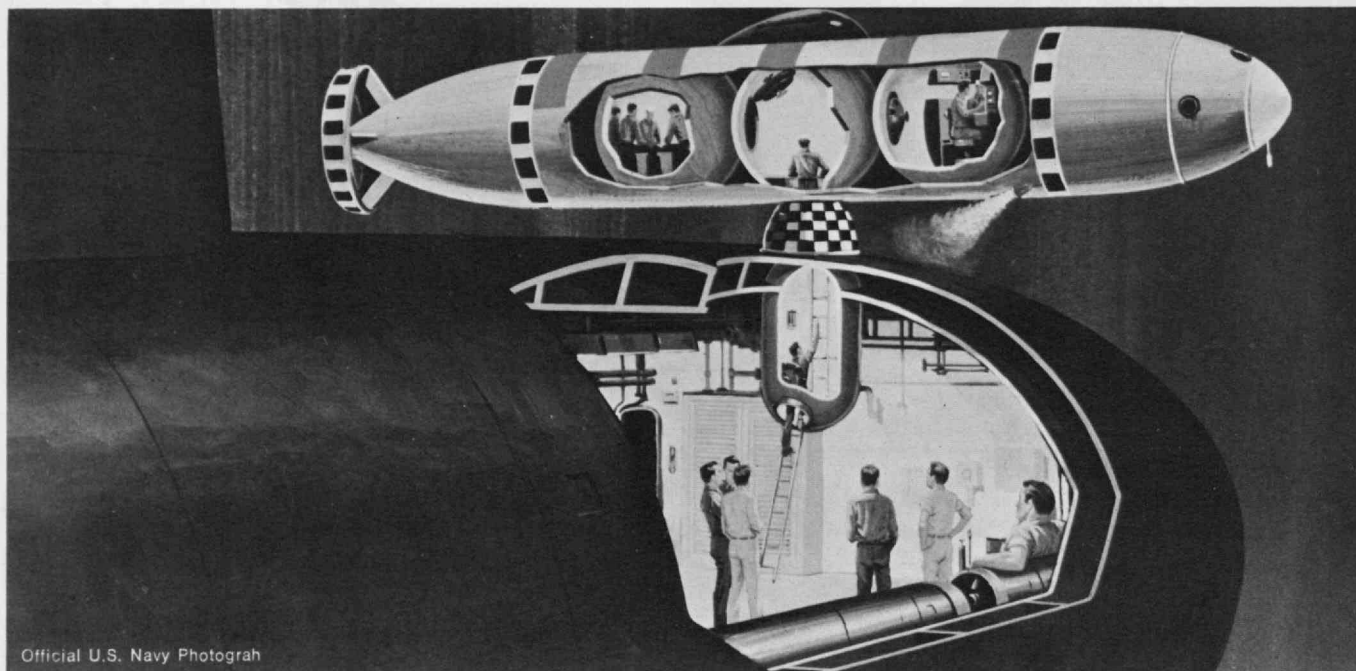
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Trend of Affairs

From Apollo to DSRV



Official U.S. Navy Photograph

The experience gained by M.I.T.'s Instrumentation Laboratory in designing the guidance, navigation and control systems for the *Apollo* mooncraft is paying handsome dividends in a new project to design similar systems for the U.S. Navy's Deep Submergence Rescue Vehicle (D.S.R.V.), shown above. The guidance hardware of this vehicle, intended as an emergency craft to rescue crews from sunken submarines, borrows heavily from that in the *Apollo* craft. This new exchange of engineers and ideas evens the score between the Navy and N.A.S.A., for the *Apollo* guidance technology rested firmly on the base set up by Instrumentation Laboratory engineers in designing the *Polaris* systems for the Navy.

Parallels between the vehicles for outer and inner space were highlighted by Jacob L. Meiry, Sc.D.'65, Assistant Professor of Aeronautics and Astronautics at M.I.T. and a consultant to the Instrumentation Laboratory, during an oceanology panel at the I.E.E.E.'s Winter Convention on Aerospace and Electronic Systems in Los Angeles. In some respects, Dr. Meiry remarked, steering and maneuvering in the ocean depths is more complex than in outer space.

One aspect of the D.S.R.V. system which leans heavily on *Apollo* technology is on-board computer handling of differences between measurements of velocity and

position from different methods. Mathematical methods developed to handle such disagreements with the *Apollo* on-board computers are finding immediate application in D.S.R.V. Inertial instruments aboard the D.S.R.V. such as its miniature precision gyrocompass, also owe much to *Apollo* designs.

However, the D.S.R.V. and *Apollo* Systems do show a number of marked contrasts owing mainly to differences in mission and operating environment, Dr. Meiry stressed. The D.S.R.V. needs continuous measurements of position and velocity while *Apollo*, whose trajectory is predictable according to the laws of mechanics, does not. Further, D.S.R.V. pilots will not have access to radio updates or celestial fixes. Thus the D.S.R.V. processor must integrate data from a number of sources to provide the continuous readings.

D.S.R.V. also has more stringent control requirements than spacecraft, particularly for rendezvous with a distressed submarine. In addition to continuous buffeting by ocean currents, it will encounter a suction effect as it approaches its target, water in the space between target and D.S.R.V. flowing faster as the gap narrows. In fact, even the turning of its propeller will produce cross-coupling in the direction of thrust that tends to throw the D.S.R.V. to one side.

In action, the D.S.R.V. will have to overcome these hazards and couple with its target with an accuracy of one inch either way. In view of the control complexity, the Instrumentation Lab engineers have designed a separate digital differential analyzer system to act as the D.S.R.V.'s automatic pilot, a function carried out in *Apollo* by the central processor. Even with this refinement in navigation and control, concluded Dr. Meiry, D.S.R.V. will require human operators; automatic control could not cope with the complexity of maneuvers such as hovering and closing on the target.

Pilot Model Library

By next fall, a small group of M.I.T. faculty and staff—"guinea pigs" in Project INTREX's first tests of its experimental computer-based library system—will be able to sit down at a special console in the M.I.T. Engineering Library to carry on a dialogue such as this with one of M.I.T.'s time-shared computers:

User: Search for information on "display consoles."

Computer: 500 documents found. Do you want titles?

User: No. Search only for "digital computer consoles."

Computer: 150 documents found. Do you want titles?

User: No. Search only for documents since 1966.

Computer: 10 documents found. Do you want titles?

User: Yes.

The machine will then display the titles, authors, and other catalog data. To help him further decide which material he really needs, the user will be able to ask the machine for the technical level, corporate source, length or language of each document and, having made a further selection, for display of an author's abstract of any document of interest, and finally for the full text. In response to this last request, a readable copy of the document itself will be displayed at an adjacent console, and the user will be able to photograph this display and so take his own copy away to his laboratory—all without ever entering the Engineering Library's labyrinthine stacks.

This vision of the "pilot model" library-of-the-future emerged this winter in a series of four M.I.T. seminars to report progress in the first two years of M.I.T.'s Project INTREX. Its purpose is to demonstrate and test the usefulness of an augmented, digitally encoded, computer manipulated, remotely accessible catalog and a storage and transmission system for the remote display of full text. Together, these two will provide a powerful finding tool and guaranteed rapid access to the full text of any document chosen for indexing.

Even at this "pilot model" level, it is a prodigious effort: by fall, 10,000 documents in certain fields of materials science and engineering will be in the "augmented catalog," with title, author, publisher, affiliations, technical level, subject index, abstract, and other pertinent data and a full microfilm copy—all available for recall upon a user's demand. The console from which the library user will work (including keyboard, cathode-ray-tube display, and light pen) is now being built, and a system for reading, transmitting, reconstructing, and projecting microfilm is in the last stages of development. Through it all, there are to be continuing studies of the human factors in cataloging and

library use to demonstrate the true costs and benefits of the automated library.

Both the cost of processing documents into the augmented catalog and computer expenses concerned with its use will be high. But INTREX anticipates the time, not far distant, when computer-controlled methods will be involved in editing and producing most technical and professional journals; at that time, cataloging and indexing will be automatic, according to J. Francis Reintjes, Director of the Electronic Systems Laboratory where the INTREX computer developments are centered.

In his fourth INTREX report, Carl F. J. Overhage, Director of INTREX, summarizes these developments and calls special attention to the existence of "a cohesive team of faculty, students, and research staff with information transfer engineering as the group theme." This group will be the nucleus, he says, of a "growing band of young engineers dedicated to the judicious application of new technology to the problems of information transfer in libraries and elsewhere."

Feeling for CO

Though carbon monoxide occasionally makes headlines as the cause of death in an automobile, its presence far more often contributes to trouble by subtly reducing a driver's alertness and impairing his judgment. Now Eugene F. Finkin, '62, has developed a simple device to warn drivers of excessive concentrations of this colorless, odorless gas.

Dr. Finkin's plan is based on the facts that carbon monoxide concentrations in automobile exhaust can be inferred from concentrations of carbon dioxide (the usual ratio is 1:2), and that the thermal conductivity of air varies with its carbon dioxide content. His warning system is an electronic circuit (a temperature-responsive impedance bridge) which compares the conductivity of air inside and outside a car; the circuit is triggered to sound an alarm when concentration of carbon dioxide inside the car rises to seven times the reference amount outside.

Bomb or Earthquake?

The crack of a sonic boom closely resembles the sound of an explosion. Similarly, the earth tremors from an underground nuclear explosion are hard to distinguish from those produced by an earthquake of comparable magnitude, especially if (as is often the case) the event is relatively small and/or distant from the seismic detector. Coupled with Soviet reluctance to accept on-site inspections sufficient to help resolve such uncertainties, this is a principal technical deterrent to the extension of the existing nuclear test ban treaty to include underground testing. Paul E. Green, Jr., Sc.D.'53, leader of Lincoln Laboratory's Seismic Discrimination Group, highlighted progress in overcoming this technical barrier in a recent seminar.

In the past two years, Lincoln Laboratory has made considerable progress in the evaluation and development of improved techniques for distinguishing explosions from earthquakes, using the Large Aperture Seismic Array in southeastern Montana, developed and operated by Lincoln for the Advanced Research Projects Agency of the Department of Defense (see *Technology Review*, Dec., 1966, p. 28). By far the largest system of its kind ever attempted, LASA comprises nearly 600 sensitive seismometers and associated signal processing and data transmission facilities distributed over an area that is half again as large as the Commonwealth of Massachusetts.

By virtue of its large extent, large number of sensors, and sophisticated processing system, LASA can determine the geographical location from which a seismic disturbance originates within a few hundred miles, and the system affords a substantial improvement (as much as 22 decibels better than a single seismometer) in distinguishing the desired signals from unwanted vibrations from other sources. Hence LASA can observe and document pertinent signal characteristics with unprecedented clarity and precision and study smaller and/or more distant events than can be observed by individual seismometers or smaller arrays. Since smaller events are more numerous and more frequent than large events, LASA has been able to acquire and process self-consistent data in substantial quantity as well as quality. Thus it has proved to be a seismological instrument of great research value, as well as a way to re-evaluate well-known discrimination criteria.

Some signal properties indicate the location, time, magnitude, and depth of a seismic event. Other criteria that may discriminate explosions from earthquake signals include: the direction of "first motion"—compression or rarefaction; the "complexity," a measure of the relative intensity of seismic activity that may continue for some time after the initial shock; and the "spectral ratio" of higher frequency energy to lower frequency energy in the initial shock itself. Signals from an explosion should have a lower complexity and a higher spectral ratio than those from an earthquake, and should invariably show a compressional first motion.

The LASA results show that no one of these criteria by itself provides reliable, unambiguous discrimination of explosions from earthquakes in all cases, but that the composite application of several criteria to the same event can provide considerably better discrimination. Typically, a single criterion can correctly identify earth-

quakes as the cause of some 60 to 80 per cent of a series of incoming signals; on the other hand, by considering magnitude, depth, spectral ratio, and source location jointly, for example, 120 events were correctly classified as 101 earthquakes and 19 explosions.

Operating experience with LASA has shown how to design a large array with comparable performance but only half as many seismometers, and with a corresponding reduction in cost and complexity. One subarray of the new design has been installed and tested in Montana, and one is being installed in Norway, where consideration is being given to the installation of a large array, funded by A.R.P.A. with technical assistance from Lincoln Laboratory, to be operated by the Norwegian government as a seismological research instrument. Meanwhile, Lincoln has transferred administrative responsibility for continuing operation of LASA to the Air Force; the Laboratory will continue to provide technical advice to A.R.P.A. and to collect and analyze selected data from LASA and other sources.—*John A. Kessler*

Urban Poor-1985

Transportation inadequacies are part of the climate of frustration among underprivileged residents of America's central cities, who see more affluent citizens and their factories migrating to the inaccessible suburbs. And today's trends suggest that the situation will be more—rather than less—difficult in the future, according to Alexander Ganz of the M.I.T. Department of City and Regional Planning in a report made at the 47th meeting of the Highway Research Board of the National Research Council in Washington, D. C., this winter.

In 1945 twice as many residents of metropolitan areas lived inside the central cities as lived outside. Increasing prosperity, the gradual lowering of the average age of heads of households, and our increasing mobility will reverse that ratio by 1985. The number of automobiles in the U.S. will by then have doubled, and the automobile will—even more than now—dominate travel patterns of urban America, Mr. Ganz believes.

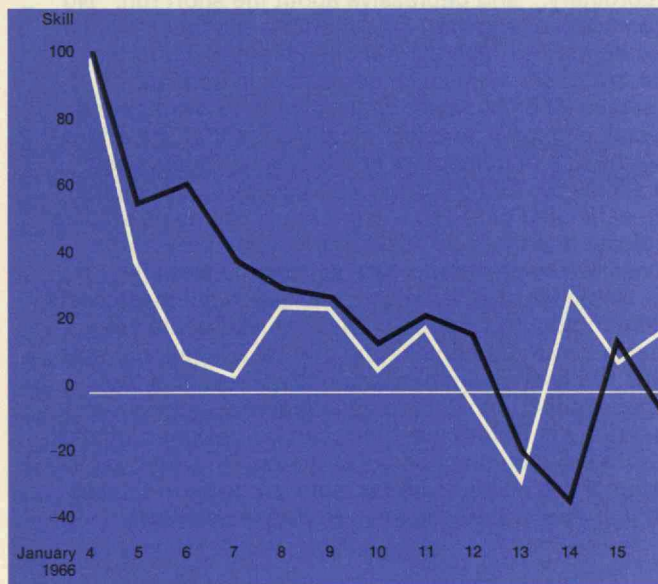
While the share of urban households without automobiles will be halved by 1985, Mr. Ganz predicted that almost a quarter of the residents of central cities will still be without cars. These people will face more deprivation than they do at present, since many working locations will have disappeared to the suburbs, out of range to central city dwellers—unless public transportation can be developed to open up these new locations to them.

Extended Optimism

While increasing numbers of meteorologists see detailed weather prediction to periods of two or three weeks as a realizable objective, Jerome Namias, S.M.'41, Chief of the Extended Forecast Division of the E.S.S.A. Weather Bureau, remains the "cautious optimist." U.S. Weather Bureau analysis of extended forecasts on the basis of two prediction models were reported by Mr. Namias in the 1968 Harry Wexler (Sc.D.'39) Memorial Lecture of the American Meteorological Society; he concludes that extended runs by today's dynamical models can make possible day-by-day precipitation predictions at ranges up to five days or possibly a week; and similar runs may be of value to a mean forecast out to perhaps 10 days.

Future improvement of this record, said Mr. Namias, now seems to depend upon massive correlation of weather with external influences on large-scale atmospheric phenomena, such as oceanic surface temperatures and snow or ice cover. Such research seeks to isolate physical factors which play a role in producing climatic variations of a month or more, such as this example: unusually warm water in the Pacific in the summer and fall of 1962 may have caused a North Pacific anomaly in the following winter which in turn led to much stronger-than-normal cyclogenesis in this area—and to the heavy storms which plagued Europe that winter.

An important cause of poor long-range forecasts, said Mr. Namias, "lies in our inability to predict the mean circulation at one or more levels." Progress in fundamental research on the general circulation of the atmosphere "automatically carries with it the possibility of progress on the long-range weather forecasting problem," he said.



Precipitation forecasting for long periods is more difficult than temperature forecasting. The chart shows the success (measured by "skill"—a method of weighing forecast success with climatological probability) of 12-day precipitation forecasts made by two methods in January, 1966. Both methods show "definite and substantial skill over persistence out to three days and positive skill relative to climatological probability out to eight days."

Our Plan or Yours?

Poverty is people, not statistics. Housing is homes, not buildings. "I've never met a man who hasn't once said to me, 'I want to build my own house, from the ground up. But if someone else designs and builds a house for me, I say let him keep it.'" These are the pleas of Dan Richardson, who heads the Model Cities Neighborhood Board in Boston's blighted Roxbury section. To M.I.T.'s architecture and planning students this winter he had this advice: Professionals with the best intentions have come into Roxbury with broad assumptions about community needs and the ways to fulfill them. But they were unwilling to learn what they did not know, and so their purpose was to give charity, not to give true help.

The task of the Model Cities Neighborhood Board which Mr. Richardson heads is to bring architects, planners, and people together, a pioneering effort to combine professional action and self-help, he said. The problems are legion. The people who need the most help are the hardest to reach; they are hard-core poverty cases who cannot even find money to pay a baby-sitter while they go to a meeting. Schools and agencies want to help at theoretical and political levels; what citizens need to know is such practical information as how to rehabilitate a house or how to raise money to consolidate property. The power structure in a city does not truly serve the community; it serves itself by serving statistics—how many people are helped, not how well. Planning is a "device for political, social, and moral justification"; so it is easy to plan but very hard to act. If you really want to serve the people, you have to talk with them; but last summer M.I.T. students had more access to planners' plans for Roxbury than the community groups the plans were meant to serve. And in neighborhoods, too, there is pettiness and ignorance, as people whose lot has somehow improved ignore the people in whose class they once were.

Computer Semantics

Educational technology is caught up in the same dilemma that has dogged the development of military and space technology—the problem of reconciling what is possible and scientifically defensible with what is fashionable and therefore fundable. Anthony G. Oettinger, Gordon McKay Professor of Applied Mathematics at Harvard and Director of Harvard's Project TACT (Technological Aids to Creative Thought), told the first of an M.I.T. series of colloquia on computers in education this winter that money goes not to those who are doing basic research but to those who are willing to claim immediate results. Myth-making and "semantic perversion" are being used to link the funding of computer experiments in education with such popular goals as "equalization of opportunity" and "individualization of instruction," he said.

"The deeply ingrained insistence by some sectors of public, Executive, and Congressional opinion on immediate, tangible, large-scale, geographically distributed results leads to massive fits of double-think," he insisted. "Thus, encouraging laboratory results and vague mumblings about accelerated-progress-in-a-world-of-change blaze prematurely into glorious but ill-considered promises of immediate delivery. As a result," he complained, "notions that are quite defensible, rational, and interesting as objects of theoretical or experimental research are ballyhooed and perverted into fads whose massive dissemination is as irrational and potentially as pernicious as their original intent was intelligent and potentially useful. Worse yet, if there is a reaction, the wheat risks being thrown out with the chaff."

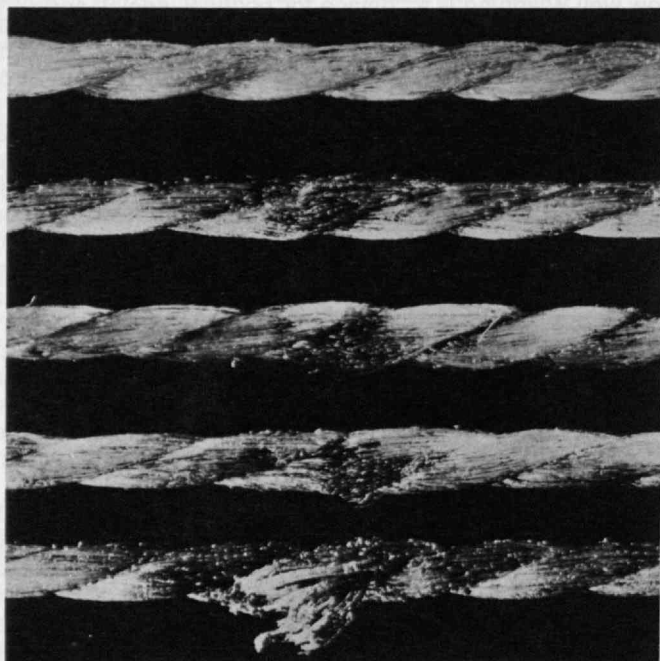
Dr. Oettinger described himself as manic-depressive about the future of educational technology—manic about the long-term possibilities, which he termed "extraordinary," and depressive about the short run. "No significant changes in the American education system during the next decade will be a direct result of the current experiments with computers in education." It will take 20 or 30 years, he predicted, to overcome the social, economic and technical factors that are retarding the use of computers in education. Today, costs of simply providing a pupil with access to a computer are estimated at \$12 to \$14 per hour, and some studies indicate that the total costs of providing pupils with consoles are as high as \$40 per hour. Eventually, Dr. Oettinger said, it may be possible to get these costs down to about \$1 per hour. Meanwhile, people are talking about the engineering of total educational systems involving computers when they have only the vaguest notion of what an educational system is supposed to do. Before machines can be designed to take over the routine functions of teaching, Dr. Oettinger insisted, there needs to be far more progress in finding out just how children learn.—*R. Eugene Bullock*

Tire Fatigue

Failure of automobile tires is generally attributed to failure of the cord. However, this may be too simple a view of what is really a systems problem; studies at Fabric Research Laboratories, Inc., in Dedham, Mass., suggest that failure often starts in the region where cord and rubber are joined by adhesive.

The studies, reported at a meeting of the Fiber Society in Princeton, N. J., were undertaken by G. A. M. Butterworth, S. M. '61, and M. M. Platt, '42, of Fabric Research Laboratories, and J. Davis of the Chemstrand Research Center, Inc., a subsidiary of Monsanto Company. The group subjected samples of dipped and stretched nylon tire cord embedded in vulcanized rubber to a programmed repetitive straining simulating the strain cycling that a tire would encounter in rough conditions of use.

The findings showed that no single component of the tire can be held responsible for its fatigue failure. The adhesive, the rubber and the cord each contribute to the over-all durability of the system, and the performance of each depends to some extent on the performance of the other components. The work suggests that manufacturers would improve the durability of tires by using a more durable adhesive with greater extensibility to bond nylon and rubber. By maintaining a continuous seal, such an adhesive would prevent the cord from loosening its bond with the rubber.



Failure sequence of adhesive coated nylon tire cord removed from tire carcass rubber following a strain test simulating failure in automobile tires. Tests at Fabric Research Laboratories Inc. suggest that this represents failure of the cord-adhesive-rubber system rather than simple failure of the nylon cord.

Doctors' Computer

The use of computers as diagnostic aids for doctors is receiving much attention today. Generally, computers carry out diagnosis on their own terms, using their natural advantages—such as a large capacity for storing information and ability to calculate rapidly—in a way that human doctors cannot hope to emulate. However, diagnostic computers could well benefit from the methods the doctor uses in his consulting room, according to G. Anthony Gorry, Ph.D.'67, Assistant Professor of Management at M.I.T., and G. Octo Barnett, Director of the Laboratory of Computer Science at Massachusetts General Hospital.

In general, a doctor does not initially obtain sufficient information from a patient on which to base his diagnosis. Thus he develops a current view of the problem in the light of what information is available and his medical experience. This view largely determines which tests he should follow up to refine the diagnosis; the doctor uses only those tests which he expects to yield results of significant value in improving his current view of the problem. Following this strategy he eventually arrives at a final diagnosis.

Programmers testing the validity of diagnostic computers go about the problem differently. The computer is first given medical statistics relevant to a disease, which enable it to compute the probability that a patient with an observed set of symptoms has that disease. The programmer then feeds to it the results of a large number of tests on the patient; the computer arrives at its diagnosis by comparing results of all these tests with the medical statistics.

Thus, while the doctor reaches his diagnosis by a sequence of steps, each suggested by the result of the previous one, the computer *starts out* with all the relevant signs and symptoms. In practice, this could mean unnecessary inconvenience to patients, who would have to submit to tests which might be totally irrelevant to the diagnosis, and waste of computer time. In a recent Sloan School working paper, Drs. Gorry and Barnett discuss the application to computers of the doctor's approach—sequential diagnosis—and its use in a trial on the Project MAC system.

In the sequential program the computer's information structure contains, in addition to medical experience, the costs of tests the computer can select in upgrading its current view of the problem and costs associated with possible misdiagnosis: misdiagnosing a malignant tumor as benign is given a much greater cost than the reverse diagnosis, for example. In this way the computer can weigh the cost of extra tests against the likelihood of misdiagnosis without such tests.

The program also contains an inference function, which enables the computer to update its current view after seeing each new test result, and a test selection function whereby it chooses the next test at any stage (or chooses to cease testing and submit a final diagnosis).

Use of this program to diagnose congenital heart disease, for which comprehensive data were available, has shown that the program can achieve with a few well-chosen tests diagnostic accuracy comparable with that of the normal computer method of complete diagnosis—which in turn compares well with diagnosis by specialists in the field. Whereas complete diagnosis for this disease requires 31 tests, the sequential program needed an average of only 6.9 of these tests to achieve a reliable final diagnosis.

Drs. Gorry and Barnett emphasize that their program represents only a preliminary evaluation of the problem. However, the evidence leads them to believe that "the sequential approach is the only feasible one for computer-aided diagnosis."

Second-Best Manager

For all the lip service to its power and indispensability, truly creative interdisciplinary work is seldom if ever achieved in the practice or teaching of engineering. Indeed, says Siegfried M. Breuning, Sc.D.'57, Director of the highway transportation studies in M.I.T.'s Project TRANSPORT, the truly interdisciplinary approach requires a set of rules so intricate as to be essentially unknown. In an M.I.T. civil engineering report he says, "we appear not yet to have left the stage of discovering the depth and complexity" of the problem at hand.

For example, the manager of an interdisciplinary project, responsible for its over-all conduct and for effective interaction between disciplines, is hardly a manager at all. He is the "second-best" man in every field involved—never the best; he may—or may not—be the final arbiter of disputes between disciplines. It is a role fraught with frustration; and having defined this interdisciplinary project manager, Dr. Breuning hastens to admit that he does not know one. To make progress toward truly understanding the interdisciplinary process we need a matrix which "identifies and quantifies the interactions and scheduling requirements between disciplines and their components," a challenging project with a "very high potential payoff."

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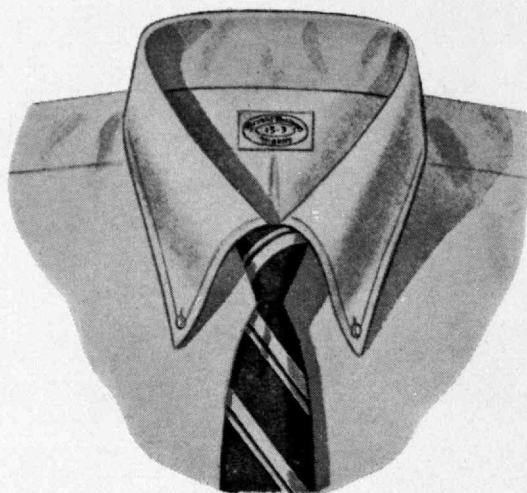
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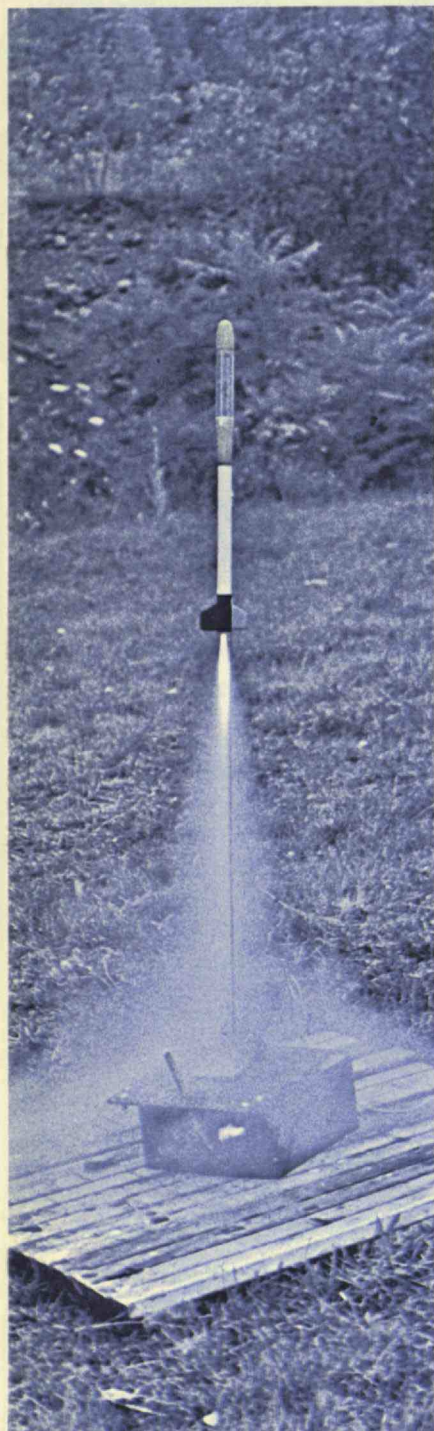
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The M.I.T. Model Rocket Society is pioneering new science for a growing national hobby

Richard Q. Fox, '68, is President of the M.I.T. Model Rocket Society. His major is physics, and his plans following graduation from M.I.T. this spring include graduate study in experimental physics.

"That One Is Going a Long Way!"



All set?
Yeah, right.
Heads up.
Five, four . . .
George!
. . . Three, two, one, ZERO.
BAMM-WHOOSH
Wow, what was that?
A B.8-6.
Hey, it worked!
That one is going to go a long way.

The launch at which these comments were recorded was not at Cape Kennedy; it was at a large field near M.I.T., and the event represented the culmination of many weeks of work and planning by the M.I.T. Model Rocket Society.

The Society came into special focus this month as sponsor of a national convention at M.I.T. for 250 model rocketeers from throughout the U.S. The effort during the two-day program was basically to raise the level of model rocketry from the shoot-it-up-and-watch-it-come-down state to a more intelligent level. M.I.T. students and other speakers described such subjects as the calculation of the center of pressure and prediction of the flight altitude and velocity of a rocket, and there were discussion groups on such topics as public relations, payload construction, and contest planning. In addition, there was a demonstration launch during the convention.

Model rocketry began about 10 years ago with the conception of the model rocket engine. Since then the activity has grown very quickly, and there are now about 200,000 active model rocketeers in the United States and many more in European countries where governments sponsor the activity. In the United States alone, many millions of model rockets have been fired (without any reported mishaps), and there are now yearly national contests and frequent regional conventions and demonstrations.

The M.I.T. Model Rocket Society was formed two years ago when several first-generation model rocketeers met on campus. The club now has an active membership of 20 and carries on a comprehensive program that includes launches during the warmer parts of the year, research, educational promo-

tion of the hobby, and regular gatherings to keep the membership posted on individual developments.

Model rockets are made from cardboard, balsa wood, and plastic and range in length from six inches to two feet or more. They are powered by commercially produced engines which consist of a disposable, wound-cardboard casing about three inches long and three-quarters of an inch in diameter with a ceramic nozzle at one end.

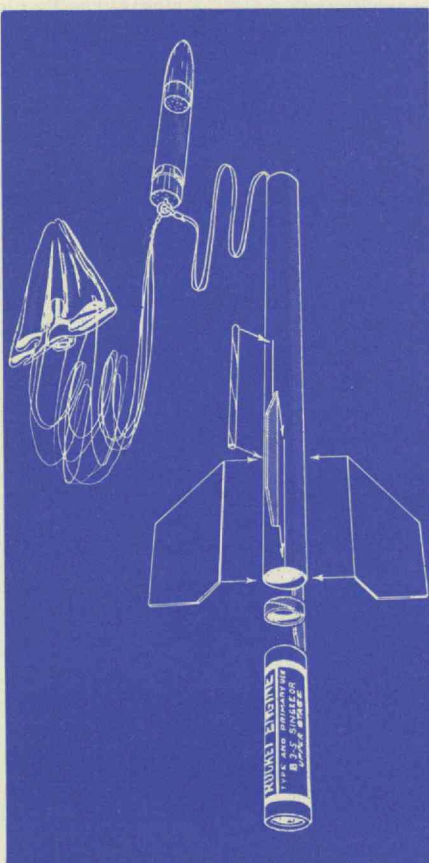
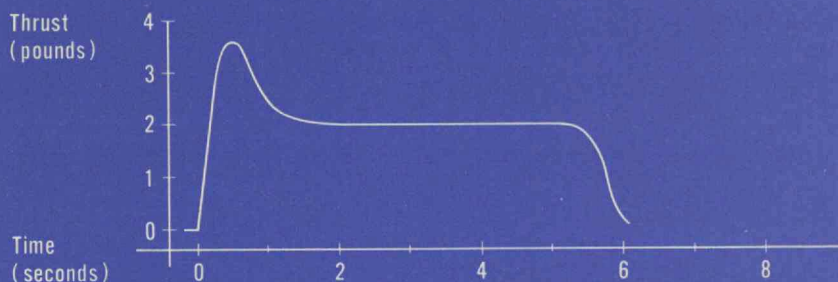
A model rocket engine contains three layers of combustible material. In order of ignition they are a solid propellant in grain form, to provide thrust; a slow-burning delay and tracking charge which leaves a smoke trail to facilitate observation as the rocket coasts to peak altitude; and an ejection charge which activates the recovery system. (Model rocketry is not to be confused with amateur rocketry, a more dangerous activity involving large metal rockets and homemade fuel.) These commercially produced, quality-controlled engines are designed to take the danger out of rocketry activities. They are not reusable, and they cannot build up sufficient pressure to explode. The engines come in a wide range of thrusts from a few ounces to 40 pounds with burning times from two-tenths of a second to 10 seconds and with a wide variety of time delays for activating the recovery mechanism of the rocket.

Model Rocket Research

Research is currently being conducted in three fields: vehicle design, payload design, and the design of mathematical models for model rocket flight characteristics.

The only limitations to vehicle design are flight stability, weight, and a workable recovery system. As a result, a group of models about to be launched from the pad may include a multi-stage payload model with parachute recovery, a single-stage rocket which glides back to the earth (referred to as a boost-glider), a single-stage rocket with spinning propeller recovery, a rocket with an additional small engine for slowing its descent, and a rocket with the engine pulling

Engines for model rockets are simple and safe. Just inside the nozzle (left end) is a packing of solid propellant shaped so that it burns with a strong initial thrust (from 3.5 to 40 pounds, depending on the engine) for perhaps 0.5 second, then a sustaining thrust lasting from two to six seconds before the fuel is exhausted. Next, a delay charge is consumed quietly for three to six seconds while the rocket coasts to its highest point; then an ejection charge releases the recovery device—usually a parachute—or ignites the second stage if there is one while ejecting the first stage. The engine itself is not reusable, but model rockets may be flown hundreds of times.



rather than pushing. The students who build such rockets become quickly familiar with the importance of the relative placements of the rocket's center of pressure and the center of mass; more than one rocket has started tumbling due to improper design.

The favorite payload for a model rocket is a small plastic box camera that is sold specifically for use with model rockets. It is designed to take a single picture of the ground at the rocket's peak altitude, which may be as high as 1500 feet. M.I.T. club members are working on improving the camera, and we are just starting to get some very high-quality photographs. Small transistorized low-power transmitters are also being installed in model rockets. Through signals received and tape-recorded on the ground we have monitored the spin rate, acceleration, and thrust time with some degree of success, but there is a good deal of work still to be done here. Other payloads include accelerometers and eggs to test the gentleness of the change of acceleration of payload rockets; a movie camera to be carried aloft is now being built. We do not work with biological payloads because the number of uncontrollable variables is too high to yield any useful information.

The third field of research is in the development of mathematical equations to predict the velocities, altitudes and durations of the model rockets' flight. Although ballistic equations have been well understood for years, these equations are solved only through approximation, and for velocities and drags in the model rocket range the approximations that result in the best answers have not been determined. The club has been using an I.B.M. 1620 for this work.

The M.I.T. Model Rocket Society has been actively promoting model rocketry in several ways. Members of the group have been presenting lectures on model rocket design at a local high school, and students have been publishing their work in *Tech Engineering News*. State laws are also under study.

Many years ago the National Fire Pro-

Range safety rules keep an iron hand on the operations of the M.I.T. Model Rocket Society—even in the excitement of the moment of launch. The bottom photograph was made by a rocket-borne camera at the moment of a flight's highest altitude; the camera has a fixed shutter speed of 1/1600 sec. at f:16, uses film of speed ASA 400 which is moved up to ASA 1200 during development. (Photos: George J. Flynn, '69)

The M.I.T. Model Rocket Society is a group of students and faculty who are interested in the study of rockets. The society was founded in 1958 and has since then grown to become one of the largest and most active model rocketry groups in the country. The society's activities include the design, construction, and launch of model rockets. The society also sponsors a variety of events, including contests and lectures. The society's members are dedicated to the study of rockets and to the promotion of model rocketry.

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"That One Is Going a Long Way!"



tection Association developed a code for the use of fireworks which was adopted by three-quarters of the states of the U.S. At that time model rocketry did not exist, and a clause in the code forbade the firing of rockets. Since then the National Fire Protection Association has learned of model rockets, and after much deliberation and consultation the Association has tentatively adopted a code for the safe use of model rockets. The M.I.T. Model Rocket Society is working to help achieve adoptions of the new code, which thus far has become law in Connecticut, California and Michigan; a bill to provide adoption of the code in Massachusetts has been introduced into the state legislature under aegis of the M.I.T. group.

In the future, members of the M.I.T. society see improved engines, more work on payloads, and a more scientific approach to model rocketry. Already a second group of college students has formed a model rocketry group at Purdue University, and there are numerous groups throughout the country which are affiliated through the National Association of Rocketry. This national group has been sponsoring contests for years, and it now provides insurance for the launching of model rockets. A \$100,000 general coverage policy costs \$5 a year—actuarial tribute to the amazing safety record of model rocketry.



Institute Review

Urban Coalition

Are modern cities ungovernable? No—no one sector of the community alone can handle today's problems, but private and public groups are now coming together to rekindle community loyalty and spirit. Can such a coalition eliminate conflict? No—there can be no "untroubled coalition," but a sensitive union of all those concerned can assure that the conflict will be productive of understanding and progress. Just as the creation of a slum requires that many interests intent solely upon making money come together, its elimination must result from a strong political and social manifestation of human concern to eliminate these root causes of blight.

The way in which the university and its faculty can participate in these affairs is far from clear, but today's crisis in our cities presents a "rare opportunity" for the academic community, according to John F. Collins, Boston's former Mayor who is now Visiting Professor of Urban Affairs at M.I.T. "There is a problem to match every professional interest and inclination. I can think of many occasions while Mayor when I would have given almost anything to be sitting in a room with this kind of expertise and commitment," he told an audience of more than 50 members of the Joint Center for Urban Studies of M.I.T. and Harvard this winter, shortly after joining the Institute faculty. "Even if I contribute nothing else," he said, "I want to convince the university community that the public sector understands English and that the private sector has an honorable desire to participate in the solution of ghetto problems."

A Boston Urban Coalition is now working to bring public agencies, industry, and universities together in the pattern which Professor Collins believes can be instrumental in both short- and long-range solutions. A great deal can be done in terms of job opportunities even before this summer, Professor Collins said, citing the opening of new plants and studies of subsidized transportation in underprivileged Boston areas.

But the larger problem is to encourage

private corporate motivation, to find a new way to involve all elements of the community in the profits of enterprise. He is encouraged, Professor Collins said, that business is beginning to develop "realistic" incentives for building new plants in slum areas, seeing the value of the increasing wealth and purchasing power which will result. These things, he said, will increase dialogue, endeavor, and hope.

Students vs. the 'Normal' People

Community relations in Back Bay is a central topic for M.I.T. fraternities since most of them occupy chapter houses in that area. But they suffer—sometimes unfairly—from the image of college students and nonstudents who now clutter such famous streets as Beacon, Commonwealth, Marlborough, and Hereford. The result is a conspicuous effort on the part of the fraternities to be good citizens and to be understood as such by their neighbors.

A small part of that effort this year included a dinner at M.I.T.'s Kappa Sigma house (33 Bay State Road) in honor of the Back Bay members of the Massachusetts General Court—State Senator Oliver Ames and State Representatives Maurice Frye, Katherine Kane, and John Sears.

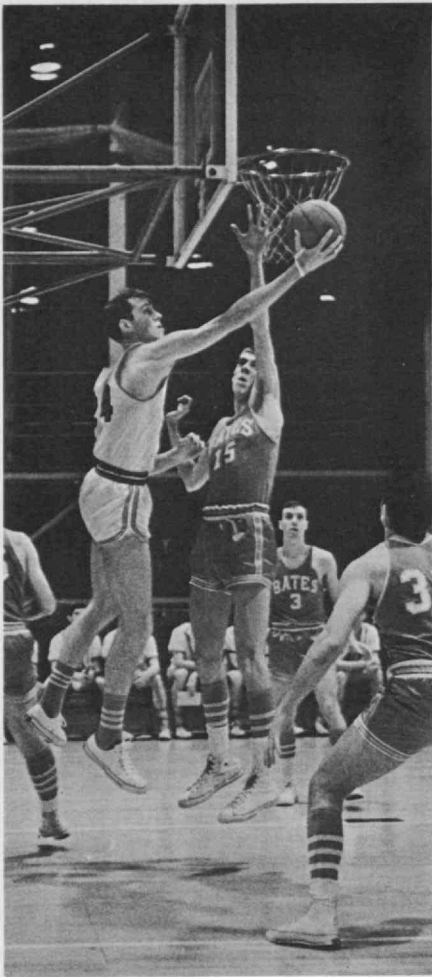
Among the guests was Michael D. Mihalka, '71, who recorded some of the highlights for *Infocus*, the M.I.T. Interfraternity Conference newspaper. Representative Sears, he said, "met with general approval when he suggested that students at M.I.T. weren't having enough fun." When they do take time off, Representative Sears suggested, their fun should be "in an M.I.T. scientific and intelligent way." More sobering, said Mr. Mihalka, was Mr. Sears's statistic that in the last 10 years the number of students in Back Bay has risen from 3,000 to 13,000, "now equal the number of normal people in the district."

Earlier in the evening, Senator Ames lamented "the noise and general commotion which frequent the area in the spring and fall evenings, distracting little old ladies from their pursuit of quiet." The fraternities, he said, are "among the most responsible groups in Back Bay," but only a few irresponsibles can destroy the good image that the fraternities deserve. And Representative Frye, noting that Boston's former mayor, John F. Collins, has joined the M.I.T. Faculty, suggested that M.I.T. students might soon have "realistic insight, on a local, practical level, into such problems as Back Bay breeds."



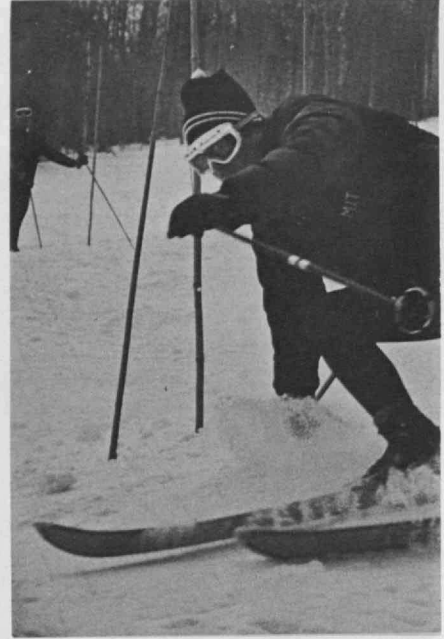
The conversation was free and friendly when M.I.T.'s Kappa Sigma fraternity entertained four legislators who represent the Back Bay in the Massachusetts General Court. John Sears,

State Representative (standing), is shown sharing the fun with Senator Oliver Ames. (Technique photo: Alfred M. Braden, '71, from *Infocus*)



Though spring has begun in Cambridge, the winter sports season lingers in memory: the best record ever made in 72 years of athletics at M.I.T. found the varsities winning 85 and losing only 47 competitions. Among the leaders were David G. Jansson, '68 (left, vs. Bates), the highest-scoring basketball player in Institute history, and Frederic W. Andree, '70 (below, vs. Army), whose 16 wins and 68 points in wrestling were new season records. M.I.T. was fourth in the National Collegiate Squash Championships and first in the New England Fencing Championships, both held in Cambridge. Skiing and hockey (below, vs. Worcester

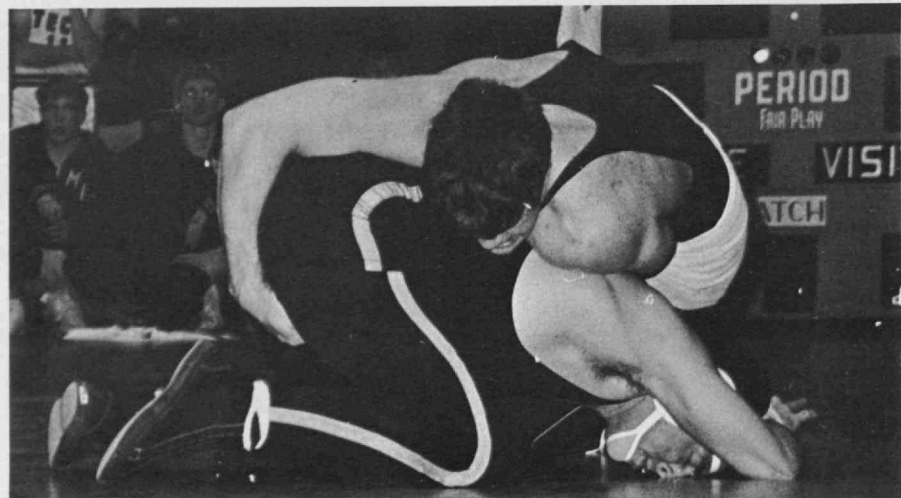
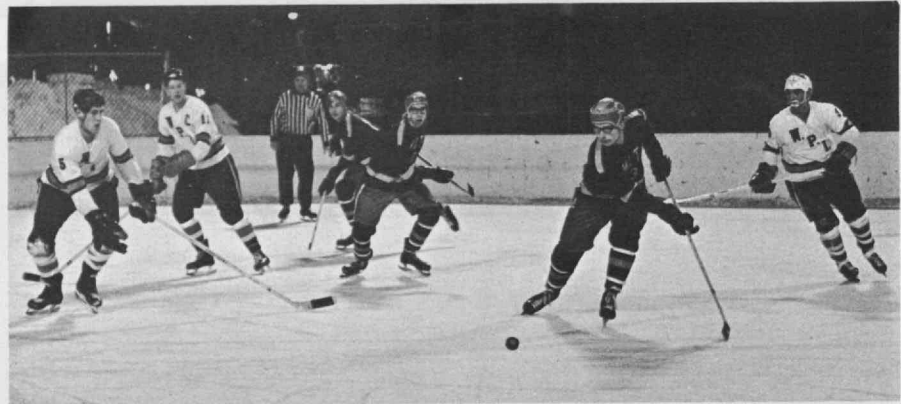
Polytechnic Institute) were near the bottom of the ladder. (Photos: Steven R. Gretter, '71, and Jeffrey M. Reynolds, '69)



Impossible Dreams

As the winter sports season neared its end in late February, the spotlight rested on basketball, track, wrestling, and squash. David G. Jansson, '68, became the highest scoring basketball player in M.I.T. history (by mid-January he had amassed 1244 points to clinch the record) and for the third time was picked for the Eastern Collegiate Small College All-Star Team; John G. Barry, M.I.T. basketball coach, said, "Jansson could play for just about any team in the country," and Harvard's coach Floyd Wilson called Jansson "one of the best shooters in the area."

For a while the squash team had the impossible dream of a perfect season, but with an 8-5 record they finally were settling for simply the best season in that sport's M.I.T. history. It was the first year of intercollegiate gymnastics competition at the Institute, and after five wins the Coast Guard finally spoiled a perfect start. Ben T. Wilson, '70, came up with "one of the most spectacular running efforts in Tech history" when he ran a 9:09.2 indoor two-mile race in the Greater Boston Collegiate Championships; in the same meet Stephen J. Sydoriak, '68, added the Greater Boston pole vault championship to his growing list of titles. Frederic W. Andree, '70, broke two existing M.I.T. records by winning every one of his first 14 starts for the varsity wrestlers.



In Skowhegan, Maine, this winter, the 80-piece M.I.T. Concert Band provided the kickoff for a \$20,000 drive of the Skowhegan Area Association for Retarded Children. Before the concert, the town met the Band at a "covered-dish supper" at Skowhegan's Smith School. (Photos: Alfred I. Anderson, 3d, '71)



Skowhegan and Shawinigan

It was M.I.T. day in Skowhegan, Maine, on January 31; first the police led a welcoming parade, then there was a potluck supper, and finally came the gala concert of the M.I.T. Concert Band, midway in its 1968 tour of northern New England and Quebec. In five days on the road, 83 students played five concerts under the direction of John Corley; their audiences averaged over 500 each, and "everything fell together as it never has during the year," says R. Kent Stockwell, '68, President of the Band.

The tour repertoire of 11 pieces included the Festival Symphony, a work commissioned by the M.I.T. Concert Band in 1965 from John Bovicchi, '44, a member of the Berklee School of Music who traveled with the Band on its 1968 tour; "Prelude and Happy Dance" by Andrew F. Kazdin, S.M.'63; Vittorio Giannini's Symphony No. III for Band; Igor Stravinsky's "Circus Polka"; and two marches by Darius Milhaud. In addition to Skowhegan, where the concert was to benefit a fund for retarded children, the itinerary included Bowdoin College, Pittsfield, Maine (S.R.O. audience in the high school), the Shawinigan Cultural Center in Shawinigan, Quebec (where clarinetist Kathryn Kanarek, '70, saved the evening by announcing program notes in faultless French), and the F. C. Smith Auditorium in Montreal, where the concert was co-sponsored by Loyola University of Montreal and Sir George Williams College. There was no income to the Band from admission charges; budgeted at \$6,300 by the M.I.T. Undergraduate Association, the tour will probably balance its books at about \$5,500.



Untimely "Arbitrariness"

Vladimir Dedijer, a distinguished Yugoslavian author and political historian, is not coming to M.I.T. this spring after all. Mr. Dedijer had been expected as Visiting Professor of History to teach a one-semester course on "The Peasant in 20th Century Revolutions," but during January the State Department announced that he had been denied a visa because a visit by him to the U.S. would be "untimely." Local speculation attributes this inhospitable attitude to Mr. Dedijer's role as President of Bertrand Russell's "war crimes tribunal."

While M.I.T. made no public protest, a number of faculty members joined with other Cambridge colleagues in writing to the State Department that "we cannot see how the national interest is served by barring Mr. Dedijer from teaching in this country." The New York Times called the Department's action "a flagrant violation of the law"; the U. S., said the Times, "seems determined to demonstrate that the Communist world has no monopoly on arbitrariness."

Mr. Dedijer served in Marshal Tito's army in World War II and was Yugoslav delegate to the Paris Peace Conference in 1946. But less than 10 years later he was expelled from Yugoslavia's Central Committee of Communists for his defense of free speech, and he was on probation in his country for six months in 1955. One of the faculty statements to the State Department pointed out, "there is irony in the fact that Mr. Dedijer, often condemned and even persecuted by Communists for his 'pro-Americanism,' should now be punished for its opposite."

National Chess Champion

Carl E. Wagner, '61, who is now a graduate student in nuclear engineering at M.I.T., holds the Intercollegiate Chess Championship of the U.S. and is tied for the Intercollegiate Speed Championship as a result of midwinter competitions at Stevens Institute of Technology. His seven wins and one draw placed him ahead of 165 other entries for the top intercollegiate honor, according to *The Tech*. But the M.I.T. team, including Wagner and David W. Drumm, '69, Lawrence C. Kaufman, '68, and Laurence L. Schmitt, '70, finished a disappointing fifth in the team competition, far behind the first-place University of California (Berkeley). Additional M.I.T. participants in the tournament were Peter J. Meschter, '69, President of the M.I.T. Chess Club, and Jed Stein, '71; Mr. Meschter was elected Executive Director of the Intercollegiate Chess League of America during the tourney.

Wanted: Quizmanship

B. Alden Thresher, '20, who was M.I.T.'s Director of Admissions from 1935 to 1960, is now a member of a blue-ribbon committee reviewing the College Entrance Examination Board's testing program. So he decided that after using C.E.E.B. scores for so many years he had better for once experience the tests first hand. Accordingly, he reported with 17 high school hopefuls to a designated M.I.T. room this winter. Professor Thresher's conclusion: the tests were "not at all difficult," but his lack of quizmanship slowed him down: "most young people in the room could locate and blacken more little rectangles per minute than I," he wrote the editor of *The M.I.T. Observer*.

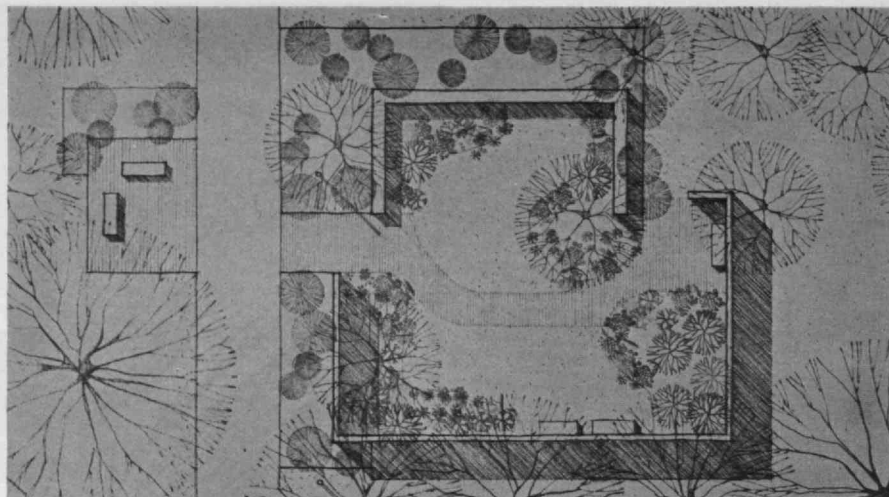
The Julie Fassett Garden will be built this spring in a 10,000-square-foot area north of Baker House and east of the Du Pont Tennis Courts. Walls and benches will make it a sheltered place for quiet visiting, but open ends will invite visitors; plantings with year-around interest are being planned.

Julie Fassett Garden

Work on the garden which will memorialize the late Mrs. Julie Pattangall Fassett will begin early this month on a site north of Baker House, and the garden will be completed for dedication on Alumni Day, June 10, according to Phillip P. Weidner, '68, Chairman of the Julie Fassett Foundation. To date more than \$18,000 has been contributed by students, living groups, faculty, and alumni wishing to honor "the Institute's most loved hostess," and the Committee expects additional contributions in both cash and garden plants during the spring months. Alumni Fund gifts may be designated for the Fassett Garden this year as last, according to Mr. Weidner. John G. Kassakian, '65, Nicholas Melissas, '52, Mrs. Kenneth R. Wadleigh, and Mr. Weidner are serving as a working committee of the Foundation for planning and construction of the garden, which is designed by Carol R. Johnson, landscape architect of Cambridge. Frederick G. Fassett, Jr., retired in 1966 after many years' service at M.I.T. as Editor of *Technology Review*, Director of The M.I.T. Press, and Dean of Residence.

Mathematics Prizes

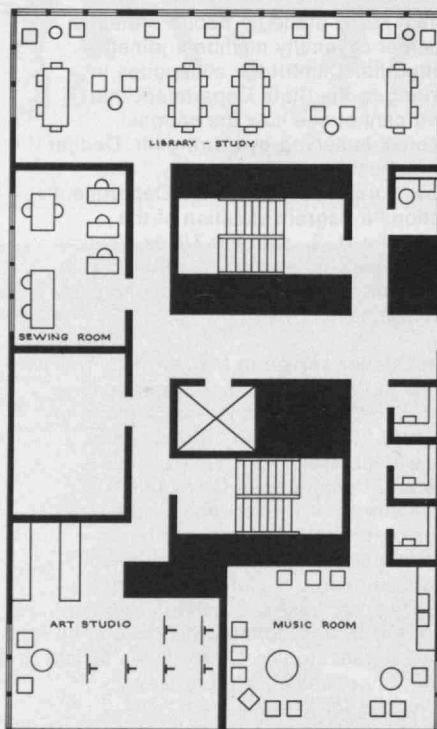
M.I.T. representatives have emerged with major prizes in the 1967 William Lowell Putnam Mathematical Competition of the Mathematical Association of America for undergraduates from throughout the U.S. and Canada. Richard C. Schroepfel, '68, and Don B. D. Zagier, '70, won \$75 prizes by placing in the top five of the entire competition; Daniel A. Asimov, '68, won honorable mention; and Charles E. Blair, 3d, '71, Daniel C. Galehouse, '70, Gerald S. Gras, '69, Mark L. Green, '68, John J. Keary, '70, Jeffrey C. Lagarias, '71, Alan S. Pollack, '68, and Michael Speciner, '68, placed within the top 100 of the 1,592 students who took the Putnam test. M.I.T.'s team entry—Mr. Schroepfel, Mr. Gras, and Robert S. Winternitz, '68—placed fourth in the team competition, behind Michigan State University, California Institute of Technology, and Harvard, to bring home a \$200 prize for M.I.T. and \$20 each for themselves.



McCormick-East

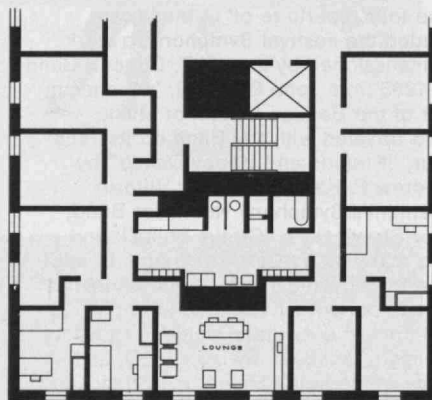
Stanley McCormick Hall-East was formally dedicated on March 1, just a month after its first residents had moved from temporary quarters in Westgate to this newest addition to the Institute's residence system. In all, the new addition to McCormick Hall will accommodate 105 women residents and three graduate student tutors, bringing the total of rooms for co-eds living in McCormick Hall on campus to 225.

McCormick-East consists of six floors of single room accommodations with two lounge-kitchenettes, one guest room-study, and toilet facilities on each floor; a penthouse with music, sewing, art, and study rooms which will serve residents of both McCormick-East and the older section of McCormick Hall (now McCormick-West); and on the main floor a recreation room, lounge, private visiting rooms, two seminar rooms, and a "country kitchen" where all can plan special entertainments.



The dedication ceremonies, held in connection with the regular quarterly meeting of the M.I.T. Corporation earlier that day, included remarks in memory of the late Mrs. Katharine Dexter McCormick, '04, by James R. Killian, Jr., '26, Chairman of the Corporation, and William H. Bemis, Partner in Baker, Hostetler and Patterson; and responses by Howard W. Johnson, President of M.I.T., and Karla S. Hurst, '68, President of Stanley McCormick Hall. Anna Bailey, '54, President, and other officers of the Association of M.I.T. Alumnae, as well as Mrs. Karl T. Compton, were among the honored guests.

McCormick-East was designed by the Boston firm of Anderson, Beckwith and Haible, represented at the dedication by Herbert L. Beckwith, '26. Its construction completed the plans for on-campus women's housing inaugurated with the construction of the first unit of McCormick Hall in 1963; gifts from Mrs. McCormick totaling more than \$5 million made the program possible.



Single rooms in McCormick-East, the newly opened extension to the Institute's first on-campus women's residence, are grouped into units of 10—two units on each of the six living floors—with each unit sharing one lounge-kitchenette (above). The penthouse (left) provides community facilities with a spectacular Charles River view.

Freshman vs. Computer

Long lines and inadequate furniture (see picture) are not the only hazards on Registration Day at M.I.T. Mitchell Serota, '71, relieved his frustrations by writing about them in *The Tech* after the start of the second term this winter: his two-day fight with the system began when the computer failed to include a 6.47 recitation in his schedule. "The computer had originally given me a decent schedule," he wrote, "but now it seemed to conspire against me by not giving me a course that would teach me how to be its master."

"When I came to pick up my revised program, I expected to see the same schedule with 6.47 stuck in somewhere. But instead I saw that it had stuck 6.47 in very nicely but proceeded to take the rest of my subjects, put them in its egg-beater brain, turn the crank 15 times, and had come up with a monstrosity."

"Among other inconveniences, the computer had ordered me to go from 54-1510 to 1-277 and then to 37-226 during the 10-minute breaks. First of all, where was building 37? 'It's that dotted-in building on the map,' offered a friend. 'No, that's building 9; 37 is over here,' returned another."

"I woke up early the next morning to start my battle. First to my counselor. 'He's not in,' observed the secretary as she looked in an empty room. 'Please leave a message.' I scribbled a note and as I left, she suggested that I try the department office of the subject I wanted switched."

"I went to the department's office where

I saw a huge line waiting for the 'dragon lady,' as the faculty affectionately calls the head secretary. After a half-hour wait, I told Miss D., 'I'd like to switch back to my original recitation.' 'Why?' she barked, flames emanating from her nostrils. I felt like I was being burned at the stake. I told her the reasons and she accepted them but curtly noted that all recitations were filled for the time I wanted. 'You'll just have to wait. Sit tight. Next?' I was smoldering.

"The next day, I tried out the schedule for MWF. I went to 1-277 just in case Miss D. threw me back in there. The instructor there read off a list of names and told anyone not on the list to see Miss D. At Miss D.'s (she was wearing a crimson dress that morning) I was told that there were no vacancies but that I should 'sit tight.'"

"In my class in 37-226, renamed 37-232 to confuse people, the instructor said that the class will be changed to building 2. That meant I didn't have to walk as much. Still, the recitation I was trying to get into was more convenient because it was in the same room as my class in the previous hour."

"I decided to sit in on the class that I planned to be in. To my amazement, the same instructor was sitting in front of the class. I explained my situation and was granted refuge from Miss D. Since the original class was more crowded, I decided to tell Miss D. that I would accept what the computer had given me. Her face matched her dress as nasty things roared from her mouth."

But I exited her office humming 'Puff, the Magic Dragon,' reassured that I had won the battle with the computer."

Sunblazer Again

The principal project of the M.I.T. Center for Space Research is back in the U. S. government's space budget for fiscal 1969. N.A.S.A. is asking for \$6.38 million, exactly the amount requested last year, according to Victor K. McElheny, Science Editor of the *Boston Globe*, who attended budget hearings in Washington early this year; Congress last year failed to appropriate funds for the program, but it gave a strong hint, said Mr. McElheny, that the project would eventually be approved.

Sunblazer is a plan to send a small satellite carrying a radio transmitter into orbit around the sun. Its radio signals en route to the earth would occasionally pass through the sun's corona, and these transmissions would then give scientists their first data on the effects of the corona on radio waves.

The \$6.38 million budgeted for Sunblazer in 1968-1969 will be used for three purposes, according to Mr. McElheny: \$2 million to begin construction of the satellites themselves, \$1.5 million to buy the first five-stage rocket to launch the satellite, and \$2.88 million to build an antenna (in California) to receive Sunblazer's signals. The total cost of Sunblazer, whose flights are scheduled to occur in 1969, 1970, and 1971, is estimated at over \$20 million.

Sigma Chi Award

M.I.T.'s chapter of Sigma Chi is one of 17 of the fraternity's 145 chapters awarded the Peterson Significant Chapter Award, the highest honor a chapter can receive for its significant performance in all major activities.



Furniture was at a premium in the Du Pont Athletic Center on Registration Day; unable to find a table on which to fill out his schedule cards, one student tried the floor—which turned out to be off the Bursar's limits. (Photo: Steven R. Gretter, '71, from *The Tech*)

Individuals Noteworthy

Samuel C. Collins, M.I.T. Professor Emeritus of Mechanical Engineering, a pioneer in low-temperature technology, has been elected a Vice President of 500 Incorporated, Cambridge. Dr. Collins, who joined the M.I.T. faculty in 1930 and retired in 1964, has been serving on the technical staff of 500 Incorporated. **Peter T. Demos, Ph.D.'51**, Director of the Laboratory for Nuclear Science at M.I.T., was elected to the Executive Committee of Associated Universities, Inc. Dr. Demos has been a trustee of A.U.I. since 1960. **George R. Harrison**, Professor of Physics, Emeritus, and Dean of the School of Science, Emeritus, has been named a trustee of Babson Institute, college of business management in Wellesley Hills, Mass.

Hoyt C. Hottel, S.M.'24, Professor of Chemical Engineering and Director of the Fuels Research Laboratory, is one of three outstanding chemical engineers sharing the Founders Award of the American Institute of Chemical Engineers. **Vernon M. Ingram**, Professor of Biochemistry, was awarded the annual William Allen Memorial Medal of the American Society on Human Genetics for his work in identifying the cause of the inherited human blood disease known as sickle cell anemia. Dr. Ingram is spending this year on sabbatical leave and is with the Department of Zoology, University College, London, England.

Howard W. Johnson, President of M.I.T., is Chairman of the Federal Reserve Bank of Boston. **Edwin H. Land**, Visiting Institute Professor of M.I.T., is one

of 12 recipients of the National Medal of Science, the Government's highest award for distinguished achievement in science, mathematics, and engineering. Dr. Land developed synthetic polarizers for light and contributed to color television and to the understanding of color vision.

Edward J. Logue, former Administrator of the Boston Redevelopment Authority and presently Maxwell Visiting Professor of Government at Boston University, has been appointed a Visiting Associate of the Harvard-M.I.T. Joint Center for Urban Studies. **William F. Pounds**, Dean of the Sloan School of Management at M.I.T., has been named to the Board of Directors of The Lumber Mutual Fire Insurance Company in Boston.

Greater Lafayette area professional engineers honored one of the nation's foremost engineering educators by renaming their chapter of the Indiana Society of Professional Engineers for Purdue Emeritus Dean **A. A. Potter, '03**. **Mayo D. Hersey, '09**, specialist in aeronautic instrumentation and visiting professor of engineering at Brown University, received the American Society of Mechanical Engineers Award for distinguished service in engineering and science.

Merrell R. Fenske, Sc.D.'28, was awarded the Air Force Systems Command Certificate of Merit for his outstanding contributions in fluid and lubricant technology. **Edward M. Pritchard, '30**, was appointed deputy project manager of the Mallard Project, a multimillion-dollar program to develop a communications system that will

serve to link field armies of Canada, Australia, and the United States. **Cecil Boling, '32**, President of Dunham-Bush, Inc., West Hartford, Conn., was elected President of the Air-Conditioning and Refrigeration Institute, national trade association. **Charles B. McCoy, S.M.'32**, has become the new President of Du Pont, the second among the company's 12 presidents not to be appointed from within the Du Pont family. Mr. McCoy joined the company in 1932 as a chemical engineer, shortly after receiving his master's degree from M.I.T.

Donald A. Morrison, '35, has been named Director of Distribution Planning of Crowell Collier and Macmillan, Inc. **Walter H. Stockmayer, '35**, is the first occupant of the Albert W. Smith Professorship at Dartmouth, a recently endowed professorship of chemistry.

Frank R. Berman, '36, received the Award for Meritorious Service to the Society from the New York Chapter of the New York State Society of Professional Engineers. **William E. Hartman, '37**, partner in Skidmore, Owings and Merrill in Chicago, has received a civic accomplishment award from the Harvard Club of Chicago for his role in bringing to the city the Picasso sculpture which decorates the Civic Center. **Raymond H. McFee, '37**, has been named Associate Director of Douglas Aircraft Company's advanced research laboratories in Santa Monica, Calif.

Richard L. Steiner, M.C.P.'39, has been appointed Special Consultant to Secretary Robert C. Weaver of the U.S. Department of Housing and Urban Development.

Strobe Probe

Harold E. Edgerton, Sc.D. '31

Mystery Photograph

A "fishing bat" (*Noctilio Leporhinus*) is shown in a strobe photo taken by Dr. Edgerton, David A. Cahlander, '59, and Fred Webster, as his feet contact a floating target.

Does the bat find the target by sonar or vision?



Puzzle Review

Allan J. Gottlieb, '67

Lately several readers have been requesting that I phone them to discuss some of the problems. I am afraid that this is impossible on my schedule. As I have said before, that would destroy the essence of mass communication. Please submit letters and state your grievances in writing to me at the Mathematics Department, Brandeis University, Waltham, Mass., 02154. Since often many people notice the same mistakes or ambiguities (there always seem to be some), one correction will suffice.

I have been asked what I plan to do to avoid the draft next year. Should the present situation remain, I most likely will enlist. Perhaps next year my address will include A.P.O. Does the Army need puzzle editors?

Problems

The first problem was sent in by Mark D. Horowitz, '71, about three months ago. I must apologize for the unreasonable delay in publication, but we thought we may have printed it before and ensuing investigations accounted for most of the delay. Here it is at last:

25 Given a rectangular solid box with inside dimensions of 18"x51"x69" and incompressible golf balls 1.82" in diameter, find the maximum number of golf balls that can be packed into the box. Assume that gravity is present and that the box may be rotated to any spacial orientation, so long as it is not deformed.

The following arrived from Bojan Popović, a mathematics student in Belgrade, Yugoslavia; I was very pleasantly surprised to see that my column has traveled so far:

26 On the table are given six matches of equal length. Make four identical triangles without breaking them.

The next two problems are from Shih-Ping Wang, S.M.'61, and they have also been somewhat delayed in their appearance:

27 Find the solution for the case of two odd balls both defective by the same absolute amount (but they may be opposite in sign).

28 Along the same vein, using a two-pan balance: given a set of n weights, each of integral weight w_1, w_2, \dots, w_n such that any object with an integral weight from unity to $w_1 + w_2 + \dots + w_n$, the sum of all weights can be determined.

This problem arrived from Winslow H. Hartford, '30, along with these comments: "Just a line to let you know how much I enjoy Puzzle Review. You are running Martin Gardner of *Scientific American* a good second; I've met a lot of old favorites, like the coconut problem. I don't have any football problems handy, but I suppose the type of problem which ends up 'the engineer's name is Smith' could readily be done over to end up 'the flanker back's name is Wojchieszczojyski.' Here is an old favorite of mine—a bridge problem which is a stinker."

29 With the following, South is the declarer at seven spades. West leads ♣8. The problem is to make seven against any defense.

♠ K J 9 7 6
♥ A J 9 6 5
♦ —
♣ A J 9

♠ Q 10 8
♥ K
♦ K 3 2
♣ 8 7 6 5 4 3

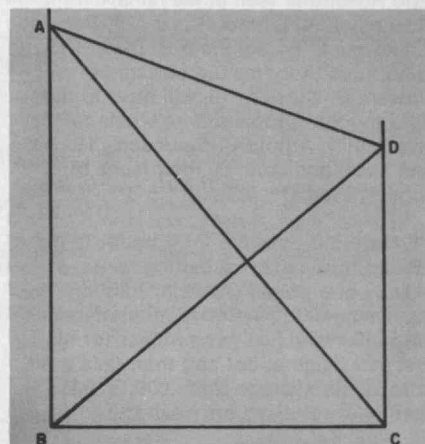
♠ —
♥ Q 10 8 7 4 3 2
♦ Q 10 8 7 4
♣ K

♠ A 5 4 3 2
♥ —
♦ A J 9 6 5
♣ Q 10 2

Speed Department

SD9 Joseph W. Lovell, '13, asks you to find the fallacy in his proof: given that $a = b + c$, then $a = b$. This is the proof:
 $a = b + c$
 $a(a - b) = (a - b)(b + c)$
 $a^2 - ab = ab + ac - b^2 - bc$
 $a^2 - ab - ac = ab - b^2 - bc$. Then
 $a(a - b - c) = b(a - b - c)$, or
 $a = b$

SD10 Richard P. Bishop, '59, submitted the following problem of Dr. Murray Spiegel:



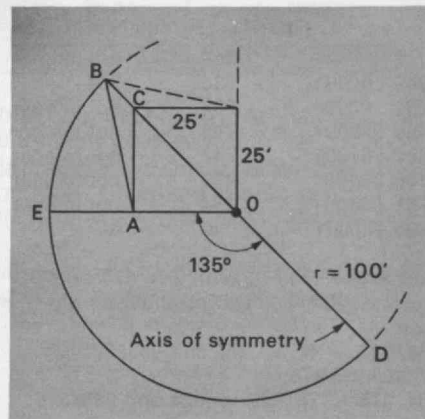
Given that angle $ABC = \text{angle } BCD = 90^\circ$, angle $DBC = 40^\circ$ and angle $BCA = 50^\circ$, find angle CAD using only a straight edge and compass.

If the solutions to Speed Department problems are difficult, I will print them.

Solutions

10 A farm horse is tethered to one corner of a barn 25 feet square, in the middle of an open field, with a rope 100 feet long. What is the area the horse can graze on?

The following solution is by Marshall Greenspan, '61:
 In the following drawing, the area for grazing equals twice the area of sector EOD plus twice the area of sector BAE plus twice the area of triangle ABC.



The first step is to determine the angle BAC, which equals $\sin^{-1}(25/75 \sin 135^\circ)$, which is $13^\circ 38'$. Therefore angle BAC equals $180^\circ - 135^\circ - 13^\circ 38'$, or $31^\circ 22'$. Next, determine angle BAE which equals $90^\circ - \text{angle BAC}$, or $58^\circ 38'$. Now we can determine the areas:

$$\begin{aligned} \text{BAC} &= \frac{1}{2}(25)(75 \sin 31^\circ 22') = 800 \text{ sq. ft.} \\ \text{BAE} &= \pi(75)^2(58^\circ 38'/360^\circ) = 2880 \text{ sq. ft.} \\ \text{EOD} &= \pi(100)^2(135^\circ/360^\circ) = 11780 \text{ sq. ft.} \end{aligned}$$

The total of these areas is 15460 sq. ft.; the total grazing area is therefore 30920 sq. ft.

To check this result, note that $\pi(100)^2 = 31400$, which is greater than 30920.

Also solved by Douglas K. Severn, '23, Eric Rosenthal (son of Meyer S. Rosenthal, '47), Mark H. Yu, '70, Douglas J. Hoylman, '64, Kenneth B. Blake, '13 (who adds that "my old classmate Howard S. Currier, '13, will have to dig up a tougher problem if he wants to stop me!"), Arnold B. Staubach, '19, and Mark and John D. Pfeil (sons of John S. Pfeil, Jr., '43).

11 How is it possible for a batter to get a hit and thus raise his batting average exactly one point? (A trivial solution may immediately come to mind, namely, the batter who has gone hitless for his first 999 times at bat and then gets a hit to raise his average from .000 to .001. Nontrivial solutions are desired.)

Richard Haberman, '67, sent in this solution:

Let x = number of hits and y = number of times at bat. The problem is to solve for x and y , positive integers, $x \leq y$, such that $(x + 1)/(y + 1) - x/y = .001$.

Consequently, $x = .001 y(999 - y)$; for x to be an integer, $y(999 - y) = 1000n$, where n is a positive integer. Therefore $y^2 - 999y + n1000 = 0$.

The quadratic formula implies

$$y = [999 \pm \sqrt{(999)^2 - 4(1000)n}]/2.$$

For y to be an integer, $(999)^2 - 4(1000)n$ must be a perfect square $\equiv z^2$; but $(999)^2 = 998001$ and hence $\text{mod}_{1000}(z^2) = 1$.

Furthermore $z \leq 999$. A quick look through C.R.C. shows the only numbers (0, 999) which end 001 are 1, 249, 251, 499, 501, 749, 751, and 999. We know that $n = \frac{1}{4} [(999)^2 - z^2]/1000$

and we easily see that $z = 249$ is the *only* solution except the trivial one ($z = 999$):

z	z^2	$[(999)^2 - z^2]/1000$	n
1	1	998	not integer
249	62001	936	234
251	63001	935	not integer
499	249001	749	not integer
501	251001	747	not integer
749	561001	437	not integer
751	564001	434	not integer
999	998001	0	0

Hence $y = (999 \pm 249)/2 = 624$ or 375, and $x = 234$. The two possibilities are then:

$$234/624 = \frac{3}{8} = .375 \text{ and } 235/625 = 47/125 = .376;$$

$$234/375 = 78/125 = .624 \text{ and } 235/376 = \frac{5}{8} = .625.$$

(Notice the symmetry.) Both are great hitters!

The "big three" solved this as well—namely, Messrs. Yu, Rosenthal and Hoylman—and so did Mr. Greenspan and Arthur W. Anderson, '63, who included a small epistle for his proof.

12 It should always be possible to solve this equation

$$x^2 + 2xy + y = 4uv + u - v$$

in positive whole numbers (greater than 0) with arbitrary values assigned to either x and y or u and v .

Arnold B. Staubach, '19, writes as follows:

"The solution may consist of the application of the New Math ideas of arrays and one-to-one correspondence, which reveal the hidden structure of the expressions on each side of the equation, together with proof by induction, as shown in the following diagrams and equations."

$x \backslash y$	1	2	3	4	
1	4 ①	9 ②	16 ③	25 ④	...
2	7	14	23	34	...
3	10	19	30	43	...
4	13	24	37	52	...
	:	:	:	:	:

$$x^2 + 2xy + y$$

$$\text{Vertical increment: } 3 \ 5 \ 7 \ 9$$

$$\text{Value of } y = 1: (x + 1)^2$$

$$\text{Increment of } y: (2x + 1)(y - 1)$$

$$\text{Sum: } (x^2 + 2x + 1) =$$

$$(2xy + y - 2x - 1)$$

$$\text{Reduces to: } x^2 + 2xy + y$$

$u \backslash v$	1	2	3	4	
1	4 ①	9 ②	14	19	...
2	7	16 ③	25 ④	34	...
3	10	23	36	49	...
4	13	30	47	64	...
	:	:	:	:	:

$$4uv + u - v$$

$$\text{Vertical increment: } 3 \ 7 \ 11 \ 15$$

$$\text{Value of } v = 1: (5u - 1)$$

$$\text{Increment of } v: (4u - 1)(v - 1)$$

$$\text{Sum: } (5u - 1) + (4uv - 4u - v - 1)$$

$$\text{Reduces to: } 4uv + u - 1$$

Unfortunately, I can't understand this solution but it looks so interesting that I

am printing it anyway. If anyone can understand it, especially Mr. Staubach, I would appreciate a letter. Messrs. Hoylman and Yu submitted partial solutions.

13 A community with N institutions of learning decides to form a football league. Each team was to play every other team once, each team was to have one idle weekend during the season, and no team would play two consecutive games either at home or away. Only one team could be idle on a given weekend. What are the chances of delivering a schedule?

The following super-elegant solution is by James E. Ruttenberg, '63 (my money says he's a math major):

Let $N = 2M + 1$ be the number of teams. We shall construct an $N \times N$ matrix representing the schedule. The i th row shall represent the schedule for the i th week, to wit: a_{ij} designates the team that is idle on the i th week. The remaining $2M$ elements are considered as M ordered pairs, the first of a pair being the home team, who are scheduled with the second of the pair, the away team. The requirements are:

1. Each row shall contain the integers $1, \dots, N$ exclusively; i.e., each week, each team either plays or is idle.
2. The first column contains the integers $1, \dots, N$ exclusively; i.e., each team is idle exactly once.
3. If a team (integer) appears in an odd column one week, it must appear in an even column the next week, and vice versa; i.e., a team alternates home and away. Column 1 is ignored for this consideration.

The following matrix satisfies these requirements:

$$a_{ij} =$$

$$\begin{cases} i & \text{if } j = 1 & i = 1, N \\ i + 1 & \text{if } j = N & i = 1, N \\ i + j & \text{if } 2 \leq j \leq N - 1 & i = 1, N \end{cases}$$

Addition is taken modulo N , and we take $N \text{ mod } N = N$, not $N \text{ mod } N = \phi$.

Requirements 1. and 2. are obviously satisfied. As for 3., the appearance of the integer k in the i th row implies $i + j = k$ for some j . In the next row, i has increased by 1, so that j must decrease by 1 for k to remain constant. An increase of 1 means a change in parity. Transitions into and out of the first and last columns are seen to satisfy this parity shift.

The following is an example for $N = 5$:

1	3	4	5	2
2	4	5	1	3
3	5	1	2	4
4	1	2	3	5
5	2	3	4	1

Obviously, any mapping that is 1-1 from the set $\{1, 2, \dots, N\}$ to itself will preserve the schedule. Hence there are $N!$ solutions, each one reflecting a different permutation of the order of teams idle.

Also solved by John E. Prussing, '62, Leo P. Buckley, Jr., '52, and Messrs. Yu and Hoylman.

14 Prove that a nonstandard ball can be determined in n weighings from a set of $(3^n - 1)/2$ plus 1 balls, one of which is marked as standard.

Here is the solution of the proposer, Charles D. Coltharp, '58:

Let Q_n be the proposition that a non-standard ball can be determined in n weighings from a set of $(3^n - 1)/2$ pl + $(3^n + 1)/2$ ph or $(3^n - 1)/2$ ph + $(3^n + 1)/2$ pl, where pl = possibly light ball or balls, and ph = possibly heavy ball or balls. Q_1 is true, since given one pl and two ph, one ph can be weighed against the other and an imbalance will indicate which is heavy. A balance will indicate that the pl is light. Because of the symmetry in the problem, pl and ph can be reversed, so the case of two pl and one ph does not need to be considered separately. In what follows, appeals to symmetry will be implied rather than explicit. P_2 is true since two unknown balls can be weighed against an unknown ball and the marked ball, and a balance will indicate that the unweighed ball is nonstandard. It can be weighed against the marked ball to determine if it is heavy or light. An imbalance reduces the problem to Q_1 . Now suppose P_n and Q_{n-1} to be true, and examine P_{n+1} and Q_n . Set $(3^n - 1)/2$ balls aside and 3^n balls remain, since $(3^{n+1} - 1)/2 - (3^n - 1)/2 = (3^{n+1} - 3^n)/2 = 3^n(3 - 1)/2 = 3^n$. Weigh $(3^n - 1)/2$ + the marked ball against $(3^n + 1)/2$ balls. If a balance occurs, the problem reduces to P_n , which is true. If an imbalance occurs, we have, without loss of generality, $(3^{n-1})/2$ pl and $(3^n + 1)/2$ ph, which is Q_n . Set aside $(3^{n-1} - 1)/2$ pl and $(3^{n-1} + 1)/2$ ph, and there remains 3^{n-1} pl plus 3^{n-1} ph. Weigh $(3^{n-1} + 1)/2$ pl + $(3^n - 1)/2$ ph against $(3^{n-1} - 1)/2$ pl + $(3^{n-1} + 1)/2$ ph, and no matter what happens the problem reduces to Q_{n-1} , which is true. Therefore P_n and Q_{n-1} imply P_{n+1} and Q_n . Couple this with the truth of P_2 and Q_1 , and we have by induction that P_n is true for all n .

Also solved by Mr. Yu.

SD4 Let n_0 be a number, n_1 be the number of letters in the spelling (in English) of the number n_0 , ..., n_k be the number of letters in the spelling of n_{k-1} . Prove $\lim_{k \rightarrow \infty} n_k = 4$,

and show that this is independent of the language used.

In general I do not print solutions to speed problems, but for this one I will make an exception. Mr. Hoylman's is the most interesting: It is easily seen that for $n > 4$, the number of letters in the name of n is less than n . (If you don't believe me, write them all out.) Hence the sequence n_0, n_1, n_2, \dots is strictly decreasing until one of the n_k is less than 5. Then we have one } \rightarrow three \rightarrow five \rightarrow four.

two }
So eventually 4 must appear in the sequence. But if n_k is 4, so is n_{k+1} , and all terms after that. So the sequence converges to 4. I can't figure out what he means by, "Show this is independent of the language used." Indeed, in German

the same thing occurs, and you eventually get stuck on "vier," but in Spanish you could either stick with "cinco" or oscillate infinitely between "cuatro" and "seis," and in French you keep going around the circle:

quatre \rightarrow six
 \uparrow \downarrow
cinq \leftarrow trois

Furthermore, in Old High Martian, the name for the number N has $N + 1$ letters, so the sequence would tend to infinity.

Also solved by Donald E. Savage, '54, and Mr. Rosenthal.

Better Late Than Never

Solutions to the following problems have come from those indicated:

79 Richard P. Bishop, '59, and Eric Hovemeyer.

3 John F. Simmons.

5 R. Robinson Row, '18, and Mr. Hovemeyer.

7 Charles S. Sutton, '35.

8 Jeffrey D. Dodson, '67, and Mr. Sutton.

Allan J. Gottlieb, '67, is a graduate student in mathematics at Brandeis University. "Puzzle Review" is written for *Technology Review* and *Tech Engineering News*, the M.I.T. undergraduate professional magazine.

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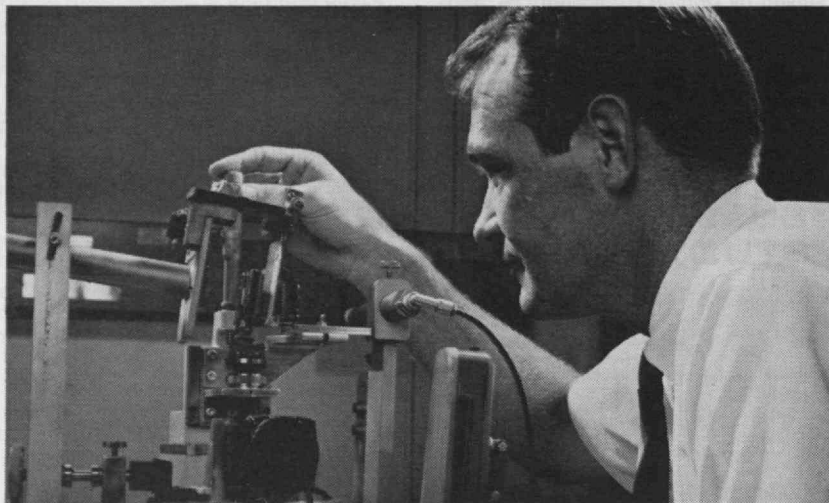
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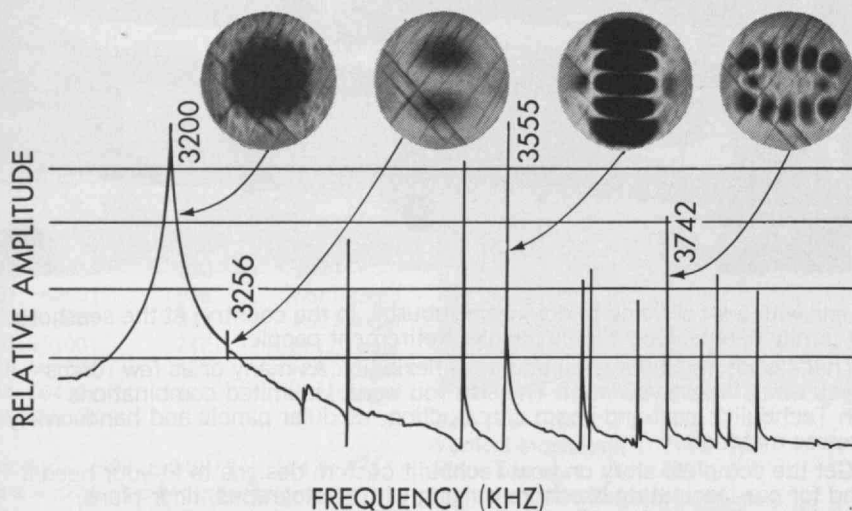
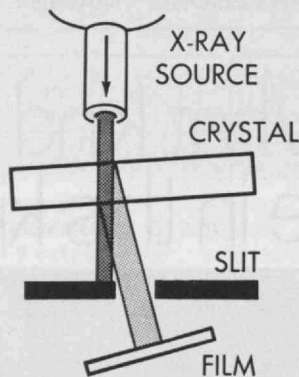
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TECHBUILT

The Anatomy of Vibrating Crystals



William J. Spencer with equipment for detecting vibrational modes. Through sloped tube, left, X-rays strike crystal (in frame at center of apparatus). A portion of beam is diffracted by the crystal (drawing, right) and passes through the slit. The main X-ray beam is stopped at the edge of the slit. During exposure, crystal and film are driven from left to right so that entire crystal area is photographed. The X-ray beam is set at a particular angle to the crystal (the Bragg angle), which for good crystals produces a diffracted intensity greater than at other orientations. Vibrating the crystal reduces destructive interference and increases diffracted-beam intensity.



X-ray photographs of a crystal showing four modes of vibration selected from the many modes indicated by the resonance peaks on the curve. Dark areas are due to displacement antinodes in the vibrating quartz disk. Diagonal lines are intrinsic crystal-lattice defects.

In modern amplifiers, filters, and oscillators, piezoelectric crystals are widely used to select signals at certain frequencies. Such crystals—of quartz, for example—provide electronic selectivity because of their ability to convert electric waves into mechanical waves, and mechanical waves back into electric waves, at certain resonant frequencies. For any particular application, the principal resonant frequency is determined by the size and geometry of the crystal, but in addition to this principal vibrational mode, the crystal will vibrate in a number of other modes.

To suppress these unwanted resonances, they must first be identified. And until recently we did this by observing patterns created when a crystal, coated with a fine powder, is vibrated at high intensity. Since the powder collects where the crystal surface is stationary, a vibrational pattern or mode is revealed. But the pattern at such high signal levels may not correspond to the modes produced at the lower signal levels of actual operation.

Recently, however, W.J. Spencer, at the Bell Telephone Laboratories location in Allentown, Pa., has used X-ray diffraction as an accurate and flexible method of observing vibrational amplitude under realistic conditions. The new method depends on the fact that the intensity of diffracted X-rays is extremely sensitive to distortion of the crystal lattice. The transmission of the rays is greater through vibrating regions of a crystal, and this darkens such areas on the X-ray film. Stationary regions are light.

Vibration amplitudes of less than a millionth of an inch are easily observed. Thus, we obtain a quick, sensitive photographic record of displacement associated with any crystal resonance under conditions simulating actual use. This technique helps us design better filters for the Bell System.



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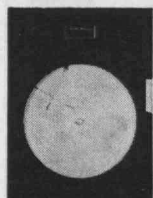
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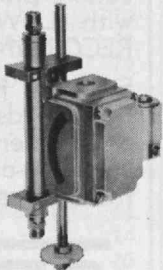
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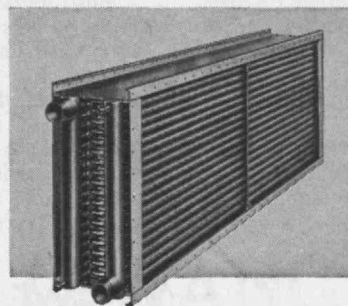
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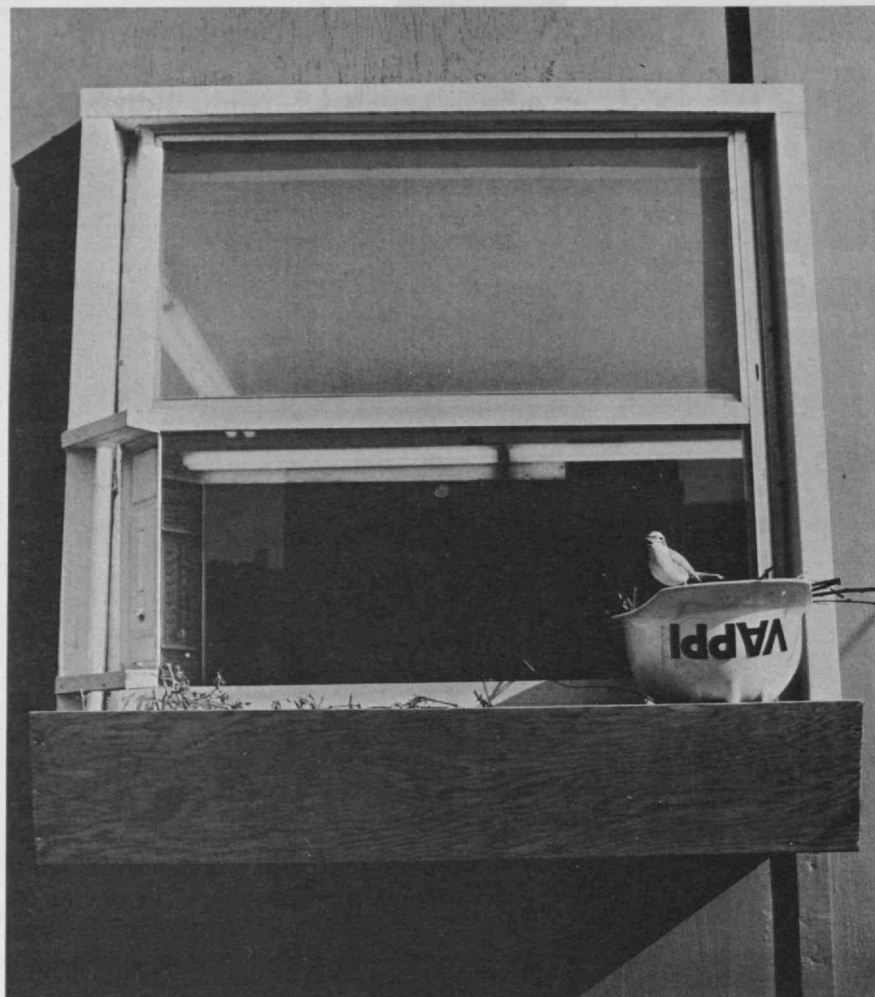
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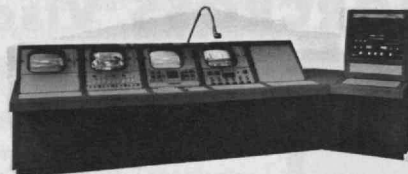
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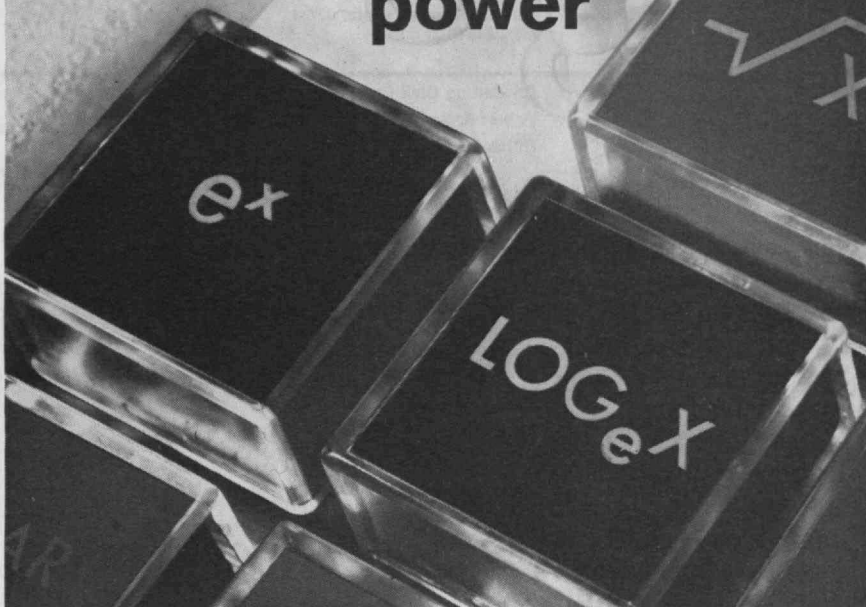
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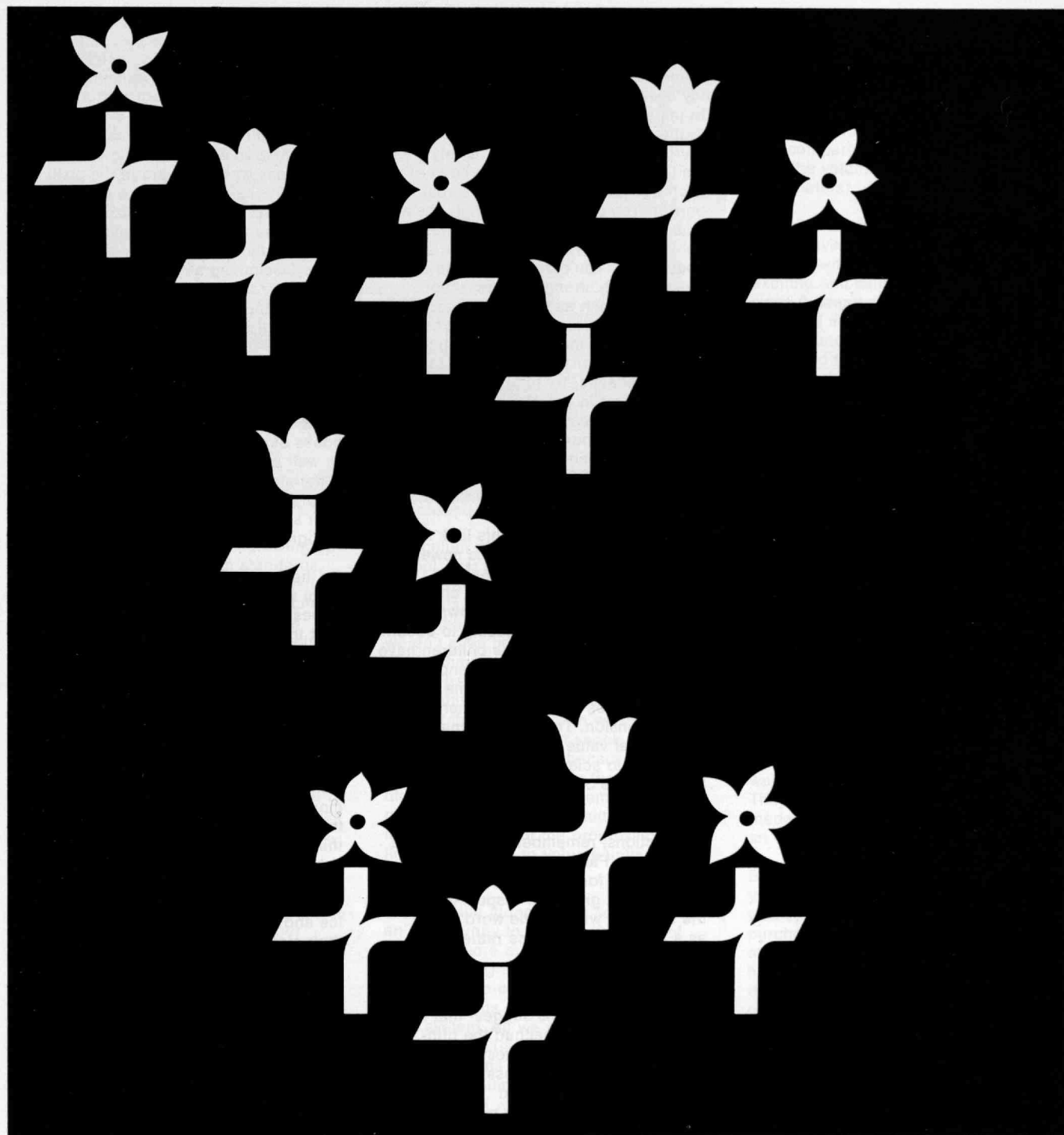
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Alumni Review



"The Biggest Thing I Ever Done"

Classroom experience cannot turn children into scientists, but their discovery of scientific truths can be moments of excitement and achievement

Today's obsession with the teaching of "science," which is to begin in kindergarten if not in nursery school, seems to me more than a little hypocritical. My own experience suggests that trying to impart the subject matter of science to the very young—those in first through fourth grades, say—is very largely limited by the short attention span at such age levels, which forms a real barrier. You can, of course, help these young children learn to make careful and unbiased observations of the world about them. You can demonstrate experiments which may interest them almost as much as the performance of a visiting magician. And you will be bombarded by innocently searching questions which you must, without becoming didactic, try to answer both truthfully and in a way that can have meaning for the children. Yet no matter how skillfully the teacher meets this challenge, the net result hardly constitutes a scientific education for the teacher's eager audience.

Undoubtedly, a sense of this lack is responsible for some of those newer projects that offer the quite-young children of the lower grades a chance to do some "exploring" of their own with the teacher resolutely refusing to become intellectually involved. The children have a lot of fun observing the life and labors of mealy bugs or inventing some new childish names for the phenomena of surface tension. These things may have educational value but they do not make children into scientists or even give them a sense of coming to grips with science.

Abstractions, remember, are not for the very young. Falling out of a tree is a hard fact. If, for instance, you tell children that gravity is responsible for the fall, they will use the word glibly, as a matter of semantics rather than science.

The Realities of Science

My own observations suggest that most children will have reached the fifth-grade level before the questions they ask suggest any awareness of what our scientific forebears called "natural laws," before their young minds really begin to perceive the reality of forces in

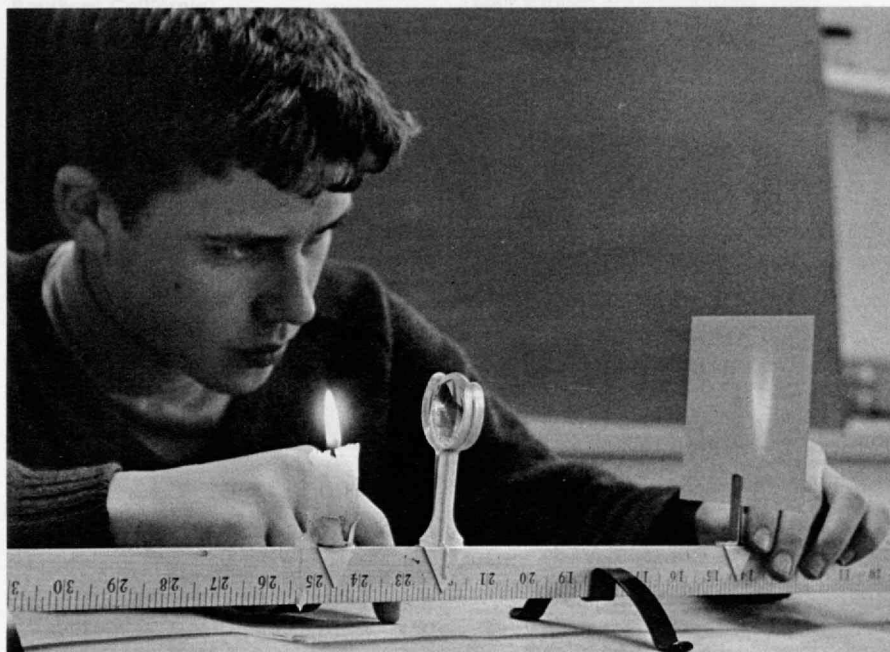
action and thus to generalize a bit on the basis of such awareness. Until this kind of awareness comes, a child may have a wonderful time examining his world and accumulating a multitude of fascinating observations and facts, but he's still not ready for real science. Most children will be arriving at that awareness while they are in the sixth grade. By the seventh grade even the slowest will be vaguely conscious that beyond the multitude of individual scientific facts lie the wider and even more fascinating areas of scientific truths. For the children this is a truly exciting moment—one to be exploited to the limit of its possibilities.

Up to this stage, I am convinced, it is the difficulty the young mind finds in dealing with generalizations that limits its response to the many excellent textbooks of general science now available as well as to "science" experiences superimposed by teachers and administrators who are concerned with keeping their school in the front line of "progress."

By the time a child has reached the point where such generalities by themselves can convey meaning, he is already past the point where they can satisfy. A child will believe—really believe—in the applicability of natural laws only after he has an opportunity to measure some for himself. When, for instance, he and his classmates have worked on something as obvious to his elders as, say, the balancing of forces (measuring weights and distances and computing moments as well) and have discovered that their values actually mean something, they feel a discoverer's sense of achievement. When they have done the only slightly more difficult work of determining the latent heat of fusion of ice and find their own values, as well as their classmates', come out in a way that seems in miraculous agreement—not only with one another's but with the ones set down in tables of physical constants—they have a triumphant sense of achievement. As one quite slow pupil, in making a report, explained touchingly, "This is the biggest thing I ever done." A bit of shared universal experience to which each has added something indubitably his own!

Bertha S. Dodge, S.M.'22, teaches science at the Overlake Day School in Burlington, Vt. She has written a number of books on scientific subjects for teen-age audiences, and she has held a variety of editorial and teaching positions; but Mrs. Dodge believes her best qualifications are "the highly developed instincts of a scavenger and the fact that I'm twice a mother and seven times a grandmother."

Science is a uniquely important experience for those who are mature enough to sense its subtle powers and meaning. For this student in the author's class at Overlake School in Burlington, Vt., the inverted image of a candle flame is in itself a subject of fascination. Its focal length determined, the lens will be used in the class project to construct a spyglass. (Photo: Paul A. Quinn)



We of the older generation, growing up in a world that, by modern standards, was scientifically not only unsophisticated but primitive, have the advantage of our juniors in that the forces we learned about and measured in high school and early college days were within relatively easy reach. Heat, light, electricity, magnetism—all were real and measurable and, insofar as usual experience was concerned, predictable. We were told that the laws we learned did not hold under extreme conditions and that correction factors must therefore be applied to the relatively simple formulas we tested. But our everyday world—as, of course, today's world—functioned mainly in the midportion of the scales. In that portion, where scientists of the past started their work, today's youngster may still start his. Since in our decades he has much, much farther to go, he will be fortunate if he can be given the opportunity of mastering such fundamentals early.

An Appreciation of Size and Weight

I have arrived at my convictions the hard way for, at various times, I've tried everything from teaching mathematics and science at a rather low college freshman level to guiding the science

curriculum of an entire independent school, first through seventh grades. In the lowest grades, the youngsters and I had lots of fun together, but it was quite clear, to me at least, that they weren't even beginning on science. At the freshman college level, on the other hand, I had become impressed by the deplorably limited understanding of most of the students with whom I came in contact. My greatest shock in this respect—undoubtedly because it was my first—was the realization that many high school graduates seemed to have no appreciation of the reality of units of measurement or of the progression from linear to surface to volume units and on to weight.

When, in the independent school, I had an opportunity to remedy this kind of lack at a more appropriate age—sixth and seventh grades—I decided to do it by having the children make simple measurements and computations in the CGS system. All we needed were some plastic rulers (in addition to blocks of various shapes and sizes). From length, area, and volume we could then move on to units of weight. To achieve this, we collected a lot of those small plastic cylinders in which pills or droptainer

bottles are dispensed. We measured base diameters and computed area by formula. Then, using a magic marker, we drew a line around each cylinder and computed the volume to that height. Finally, we weighed the cylinder, first empty, then filled to the line with water, and compared the weight (in grams) with the volume (computed in cubic centimeters).

Even the slowest pupils loved the work and, convinced they were at last coming to grips with reality, found it a truly exciting and satisfying experience. And since it seemed to work and the children besieged me with pleas for more of the same, I undertook to fill the demand. It seemed to me that with the limited equipment on hand which the children had already learned to use, the next step might be the determination of the specific gravities of a variety of materials, notably metals. For this we needed, beyond a second line drawn around our rather overworked plastic cylinders, no more than bits of a variety of metals—birdshot, iron tacks, small copper washers, bits of aluminum obtained by cutting up some of those containers in which frozen bake goods come. When our youngsters had compared the weight of water between their two lines with the weight of metal that could raise the water level from the lower line to the upper and found their determinations for each kind of metal were in some agreement, they felt absolutely triumphant. They had also learned quite a bit about laboratory manipulations in general, as well as specific gravity in particular. They were then ready to repeat Archimedes' famous experiment of weighing an object first in air, then in water.

By this time, the enthusiasm of the youngsters prompted them to hold weekly doughnut sales whose proceeds purchased us some test tubes, beakers and centigrade thermometers. Latent heat of fusion of ice could now be determined. Then came specific heats of the metals whose specific gravities we had already determined.

The adult mind might regard our crude quantitative determinations as repetitive and boring. Not so the mind of the young which has been too long bored by the kind of generalization that is handed

Science is an attitude of learning, not a special instrument. In the author's class this youngster uses window glass, microscope slides, and silicone cement to build (right) a triangular container with which will be demonstrated the different dispersive powers of liquids of different indices of refraction. When built, the container is mounted on a turntable made of telescoped cans with B-B shot in the grooves at the rim for ball bearings. When filled (left), the container is rotated in the beam from a projector to show how a spectrum is formed. (Photos: Paul A. Quinn)



down from above and which they are supposed to learn while they may actually entertain secret doubts. That they themselves can make measurements like those upon which the generalizations are based—that is a new and exciting concept.

We went on then to study balanced forces—needing only meter sticks, shower curtain hangers for suspension, spring balances and weights. Here the students could easily both note the balancing of up and down vertical pulls and compute the equal moments of their forces at rest. Then we tried working with three forces at a variety of angles, marking directions and dimensions of pulls on squared paper set up directly behind our arrangement. It was easy here to perceive the vertical and horizontal components of each pull and to perceive that, once more, these balanced. Even had they been able to cope with the trigonometric computations otherwise here involved, it was the graphic solution that carried real conviction.

A completely different kind of experiment involved nothing more complicated than wrapping paper (new and flat), meter sticks or rulers, and the kind of two-faced mirrors purchasable in most dime stores. One side of such mirrors gives a normal reflection, the other a magnified image. The plane side served for the first study of angles of incidence and reflection, and it soon became logical to extend our work on reflection



to the magnifying side, to develop some idea of the reality and approximate location of the focal point. In the next experiment, we determined focal distances of the same mirrors by taking some "object"—usually a bit of cardboard cut into the shape of an arrow point—and illuminating it strongly from the rear so that its image could be reflected and focused sharply upon a screen, which was usually a piece of stiff cardboard or plywood. The distances from object to mirror (d_1) and from mirror to focused image (d_2) were measured and the focal distance computed by the old formula: $1/d_1 + 1/d_2 = 1/f$. We repeated the measurements with object and image variously placed with respect to one another, and the youngsters found delight and wonder in the fact that their computed focal distances always came out about the same.

Now we no longer have to struggle to explain the how and why of such mirrors' magnifications. The pupils can—as one bright one did—figure out demonstrations of their own. Fixing in a clamp a mirror whose focal length he had determined as about 25 cm., he backed away, noting how his magnified right-side-up image grew in size until it became completely unrecognizable as he approached the focal distance. Then, continuing to back off, he watched the reappearance of a recognizable image, this time upside down and shrinking as his distance from the mirror increased. "Oh," he exclaimed, "That must be

because the light rays have crossed!"

The Personal Experience of Science

It requires, of course, no professional physicist to recognize that such experiments are crude and yield far from precise results. They do, however, have meaning and pedagogical value. Precision can come later. On the other hand, it is sheer hypocrisy (which our clear-eyed young can recognize all too readily) to try to persuade children that they are embarking upon pathways of true research. They are all too well aware of the fact that they are not yet equipped for this.

Though it might just turn out that some students in my classes eventually decide to go farther in science, this is not my special intent or expectation. Science is as intrinsic a part of our cultural background as the arts, and so it is just as vital that the young have as real personal experience of aims and techniques as they are given in the realm of music or art. This aim, certainly, need not be confined to the scientifically gifted youngster. That slow student who found it "the biggest thing I ever done," remembering his experience with delight, may find the whole subject matter of science less formidably alien in the adult world in which he later lives. Who knows but that at some crucial moment in the future, his attitude towards science may turn out to be as important to the future of science as the work of the scientists themselves?

Alumni Review

Southern California: M.I.T. and Urban Affairs

The role of M.I.T. in solving contemporary problems was the topic of Jerome B. Wiesner, Provost of M.I.T., before 160 members and guests at the annual meeting of the M.I.T. Club of Southern California on January 18. Dr. Wiesner cited past examples of M.I.T. technological developments having had an impact on society in general and mentioned that most of these developments were the result of one man working alone. He said that the scope of present problems is so vast that one man can no longer accomplish this.

M.I.T. is becoming involved in broad problems of society because these problems are affected by technology and are problems of the future which must be of concern to all. The joint Harvard-M.I.T. medical project, which is studying a new medical curriculum, and the development of an integrated approach between engineering and the health and life sciences for medical research are among the projects in which M.I.T. is currently involved. Urban affairs are being studied by a large group of faculty and students. During its business session preceding Dr. Wiesner's address the Club presented M.I.T. with a \$1,500 contribution to the scholarship fund, heard reports of the Program Chairman and the Treasurer and elected a new board of governors.—Antonia D. Schuman, '48, Assistant Secretary

Boston Stein Club: MCA vs. the Information Explosion

A person active in research must spend part of his time in a technical library. Merely keeping abreast of the latest developments in one's own field requires much continual effort. The enormous growth of research activities and the ever-increasing amounts of new information they produce makes keeping up-to-date increasingly difficult. Learning about new material, though, is but one facet of the present day technical information problem. Practical ways must be found to make new information available to interested persons. Old information must also be retrieved. The abstract services and the journals

they publish are well known. Their services are certainly helpful. The present volume of information is a heavy burden to these services. Traditional abstracting techniques require help from newer techniques.

Computers offer great promise in this field. Members of the Boston Stein Club heard about some of this work at their third meeting of the 1967-68 season on January 25, 1968. They heard it from one of their own members. Myer M. Kessler, '39, Director of the M.I.T. Technical Information Program and Associate Director of the M.I.T. Libraries, delivered a talk entitled "How the Computer is Changing Our Library and Our Lives." Dr. Kessler introduced his audience to MAC-M.I.T.'s multiple access computer, which is connected to consoles through telephone lines extending over many parts of the country. (One console is in the Boston Stein Club Map Room, near the M.I.T. Science Library.) A person using any one of these consoles has access to all of the information the computer contains. Thirty consoles can use the computer simultaneously in the present installation, and this number is subject to increase. . . . Demonstrations were given of some types of literature-searching which the computer can handle, using examples chosen from the physics literature. The demonstration proved that the searching can be done very rapidly and that many types of data can be handled. MAC's work is not restricted to science; it was also shown capable of searching out a cookbook for specific recipe and menu information. . . . An interesting prelude to the serious business of the evening was afforded by a pre-dinner wine-tasting buffet furnished by Myron Norman, '39. A leaflet which contained tips on wine-tasting technique and characteristics of various wines was distributed.—Melvin H. Saxe, '48, Secretary

Alumni Day: China and Homecoming

A penetrating analysis of technology in Communist China today is one highlight in a series of activities planned for homecoming at M.I.T. this June. Max

Millikan, Director of M.I.T.'s Center for International Studies, and A. Doak Barnett of Columbia University, a political scientist who has studied and written extensively on contemporary Chinese developments, are drawing together a panel of scholars specializing in various aspects of life in Communist China. Their report, on the afternoon of Alumni Day on Monday, June 10, will separate fact from fiction about Communist China's scientific and technological capabilities and present alumni with a sober appraisal of that country's weaknesses and strengths, according to Russell L. Haden, '40, Chairman of the Alumni Day Committee. "So far as we know, this will be the first public on-the-record assessment of Chinese capabilities presented in this country in several years," he said. "With international tensions growing, such a briefing is not only timely but vital."

Homecoming will begin with week-end class reunions following the M.I.T. commencement on Friday, June 7. The 50-year, 40-year and 25-year classes of 1918, 1928 and 1943 will hold their reunions on the M.I.T. campus. Other five-year reunion classes will meet at resorts throughout New England. All alumni and their families will gather at the Institute beginning Sunday afternoon, June 9, for the start of homecoming activities. Among events on the schedule are:

1. Dedication of a rowing shell at the Harold Whitworth Pierce Boat House in honor of Ralph T. Jope, '28.
2. Traditional memorial services in the M.I.T. Chapel.
3. Dedication of the Julie Fassett Garden, being built as a memorial to Mrs. Frederick G. Fassett, Jr., adjoining Baker House and Briggs Field.
4. The Alumni Day luncheon, including a year-end report on M.I.T. affairs by Howard W. Johnson, President of the Institute.
5. Annual reception and banquet, followed by entertainment and dancing in the M.I.T. Student Center.

The Sunday evening program will include a buffet dinner at the M.I.T. Student Center. Monday morning will provide a selected series of short lecture-demonstrations devoted to high spots in modern

technology. These will include reports on the application of chemical engineering to the solution of problems in medicine and health, the use of such new devices and techniques as lasers in tunneling through rock, new solutions for aging cities, new understandings about brain function, new super metals that promise improved approaches in construction, and computerized library techniques.

Alumni Calendar

New York—luncheon meeting on April 5: Julius A. Stratton, Chairman of the Ford Foundation, President Emeritus at M.I.T. and Chairman of the President's Marine Sciences Commission.

Cambridge—conference at M.I.T. on April 5 for Club Presidents: Howard W. Johnson, President of M.I.T.; Gregory Smith, President of the M.I.T. Alumni Association.

New York—Second Advanced Computer Seminar on April 9.

Boston—luncheon meeting on April 11 at the Union Oyster House: Mrs. Karl T. Compton.

Framingham—Ladies' Night (joint meeting with the Middlesex Simmons Club) on April 23: Douglas P. Adams, Associate Professor of Mechanical Engineering at M.I.T.

New York—Third Advanced Computer Seminar on April 23.

Long Island—annual election and dinner meeting on April 26.

New York—Fourth Advanced Computer Seminar on May 7.

Boston—annual meeting at the Union Oyster House on May 9.

New York—luncheon meeting on May 17: Ogden R. Reid, Congressman from the 26th District of New York and former Ambassador to Israel.

New York—Fifth Advanced Computer Seminar on May 21.

New Jersey—annual dinner meeting on May 23: Harold W. Fisher, '27, Vice President of Standard Oil Company (N.J.).

Cambridge—class reunions on June 7-9 and Alumni Day on June 10.

Deceased

Edward T. Foulkes, '98, December 10*
Charles F. Harwood, '99, February, 1967*
Francis J. Carty, '04, November 27, 1967*
Maurice Carty, '04, July 26, 1967*
Spencer A. Cutting, '06, September 15*
Andrew Kerr, '06, January 26*
Earl H. Reed, '07, January 28*
Bentley A. Merrick, '18, December 31*
Earle R. Stewart, '18, January 1*
Earle S. Bater, '24, February 2*
James I. Meeker, '57, June 16, 1967

* Further information in Class Review

SPECIAL REDUCED RATES FOR M.I.T. ALUMNI FOURTH ANNUAL TOUR PROGRAM-1968



These tours are based on special reduced air fares which offer savings of hundreds of dollars on air travel. For example, the tour to India is based on a special fare, available only to groups and only in conjunction with a tour, which is almost \$400 less than the regular air fare. Special rates have also been obtained from hotels and sightseeing companies. Air travel is on regularly scheduled jet flights of major airlines such as Japan Air Lines and B.O.A.C.

The tour program covers two areas—the Orient and India—where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and savings of group travel. There is an avoidance of unnecessary regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

In past years, separate tours have been offered for Harvard and Yale alumni. Air fare regulations for 1968 will permit intermingling of alumni on any tour, and the full program is being offered to alumni of Harvard, Yale, Princeton and M.I.T., making possible a wider choice of departure dates.

THE ORIENT 30 DAYS \$1499

Mar. 23-Apr. 21

Jun. 29-Jul. 28

Sept. 21-Oct. 20

The fourth consecutive year of operation for this fine tour, which offers the true highlights of the Orient at a sensible and realistic pace. Eleven days will be spent in JAPAN, divided between TOKYO, the ancient "classical" city of KYOTO, and the FUJI-HAKONE NATIONAL PARK. Five days will be spent in HONG KONG and four in the fascinating city of BANGKOK. Shorter visits to SINGAPORE and the lovely island of FORMOSA complete the itinerary. Optional pre and post tour stops may be made in Honolulu and the West coast at no additional air fare.

A complete program of sightseeing will include all major points of scenic, cultural and historic interest. Among the many features will be: a tour of the canals and floating markets of Bangkok with breakfast at a waterside restaurant; an authentic Javanese "Rijsttafel" in Singapore; a launch tour of Hong Kong harbor at sunset, with dinner at a floating restaurant; visits to the Toroko Gorge and the new National Palace Museum in Taipei; a trip on the ultra-modern 125 m.p.h. express train in Japan,

as well as comprehensive tours of the cultural treasures of Kyoto, full day excursions to Nara and Nikko, and other programs, all fully described in the tour brochure.

Tour dates have been chosen to coincide with special seasonal attractions in Japan: the spring cherry blossoms and beautiful autumn leaves (Tours 1 and 3) and the famous Gion Festival in Kyoto, probably the most colorful and historic pageant in the Orient (Tour 2). Total cost is \$1499 from California, \$1699 from Chicago, \$1737 from New York and \$1747 from Boston.*

INDIA

Including NEPAL and PERSIA

29 DAYS \$1549

Oct. 5-Nov. 2

This tour presents an unusual opportunity to see the splendidly diverse and fascinating subcontinent of India, together with the once-forbidden kingdom of Nepal and the rarely-seen splendors of ancient and medieval Persia. Here is India from the mighty Himalayas to the palm-fringed Bay of Bengal: BOMBAY, the great seaport and traditional "gateway to India"; the magnificent cave temples of AJANTA and ELLORA, whose thousand year old frescoes are among the outstanding achievements of Indian art; MADRAS, in the south, closely associated with Elihu Yale; the great industrial city of CALCUTTA; then a thrilling flight into the Himalayas to KATHMANDU, capital of the kingdom of NEPAL, where ancient palaces and temples abound in a land still relatively untouched by modern civilization; the holy city of BENARES on the sacred river Ganges; AGRA, with time to see not only the Taj Mahal but many other celebrated monuments of the Moghul period such as the great Agra Fort and the fabulous deserted city of Fatehpur Sikri; the walled "pink city" of JAIPUR and nearby Amber Fort; the unique hill city of UDAIPUR, noted for scenic lakes, gardens, and delicate white marble palaces; NEW DELHI, the great capital of the nation; followed by a restful stay in the fabled beauty of the VALE OF KASHMIR, surrounded by the snow-clad Himalayas. After India comes exotic PERSIA (Iran): hundreds of miles to the south of Teheran lie PERSEPOLIS, the great royal capital of Darius and Xerxes in the 5th century B.C.; and ISFAHAN, the fabled capital of Persia in the 15th-17th century Renaissance, with its palaces, gardens, bazaar, and justly famous tiled mosques.

Transportation is by air, motorcoach, motorlaunch and elephant. Outstanding accommodations include luxurious houseboats on Dal Lake in Kashmir and hotels that once were palaces of Maharajas. Total cost is \$1549 from New York.*

*Special rates from other cities. Tour cost includes:

Jet Air, Deluxe Hotels, Meals, Sightseeing, Transfers, Tips and Taxes.

For	Alumni Flights Abroad
Full	P. O. Box 99
Details	Lenox Hill Station
Contact:	New York, N. Y. 10021

Kane on M.I.T.



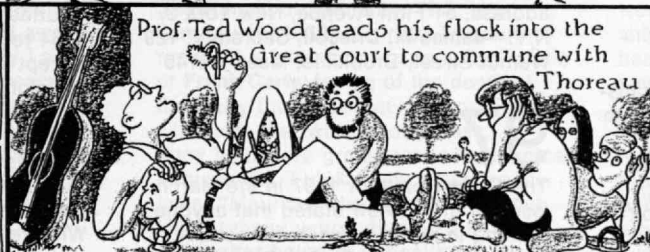
comes to m.i.t



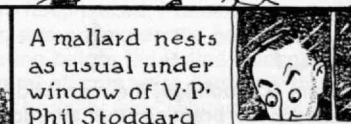
With the ice breakup, Crew Coach Jack Frailey whips his charges into shape on the frigid Charles



A raccoon makes its annual appearance outside window of Ass't. Treas. Fred Watriss



Prof. Ted Wood leads his flock into the Great Court to commune with Thoreau



A mallard nests as usual under window of V.P. Phil Stoddard



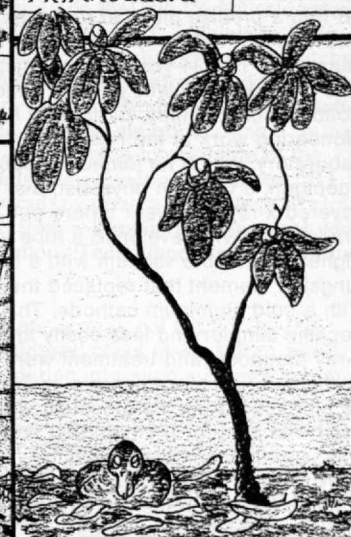
First dinghy overturns



The alewives are running again



Nature-loving groundskeeper greets Spring's first dandelion



Natural result of liaison with Wellesley: Athletic Director Jim "Ross" Smith leads team in 19th varsity sport

Class Review

95

It is now 73 years since our graduation from M.I.T., and we can report that we have three living members. I presume that this is a record in itself because two, **Charles Berry** and **Luther Conant**, are 95 years of age and yours truly is 94 years old. We are grateful to be in the 20th Century world and even though our lives are not exciting, we do have many worthwhile memories.—

Andrew D. Fuller, 1284 Beacon Street, Brookline, Mass. 02146

96

William D. Coolidge, the man who transformed x-ray practice from an uncertain art into a precise medical tool, was awarded his first x-ray tube patent 50 years ago. The 94-year old scientist, who lives with his wife at 1480 Lenox Road in Schenectady, performed his pioneering work at the Research Laboratory, which he joined in 1908. Roentgen, a German physicist, discovered x-rays the year before our graduation. Will developed a tube with highest attainable vacuum with a hot tungsten filament that replaced the tube with a cold aluminum cathode. This tube became simpler and less costly and x-ray diagnosis and treatment were available to greater numbers. In 1908 he produced a ductile tungsten, which in itself was a major triumph, that later was used in incandescent lamps.

In World War I he developed a tube suitable for use in the war which was later modified for peacetime use. The enthusiastic reception of the tube for medical use was climaxed with an honorary M.D. degree awarded to Will in 1937 by the University of Zurich in acknowledgement of his outstanding achievements in the field of applied physics in medical science.

Just too late for the March issue were Season's Greetings received from **Walter S. Leland**, 173 El Camino Corto, Walnut Creek, Calif. 94596: "If it was not for my handicap I'd be vying with you for the job of Secretary. I'm coming up towards 92 years of life and still have a little cheer left. It

reminds me of the story of the poor unfortunate fellow who found himself in jail and when asked how he felt about all of his misfortunes, he said, 'Ah's just learned to cooperate with the inevitable.'" . . . In a typewritten letter from Fresno, **Herbert D. Newell** acknowledged receipt of my Christmas card. He is in pretty good physical shape though subject to the usual failings of sight and hearing which many of us are experiencing. He read in a civil engineering publication of the death of **R. E. Bakenhus**, from whom I have received no word in recent years, nor replies to several letters sent to his last mailing address, 51 Fifth Avenue, New York 3, N.Y.—**James M. Driscoll**, Secretary, 129 Walnut Street, Brookline, Mass. 02146

97

The Class Notes for 1897 in the March issue of the *Review* stated that anyone wishing to report news could send it to the *Technology Review* Office. However, news can be sent directly to me, **George Wadleigh**. . . **Ed Hawkins** reports that he has two sons who graduated from M.I.T.: Richard P., '27; and Edgar, Jr., '30, who now lives in New York. . . We received a Christmas card from **Will Binley**. . . I wish all of the members of our Class a very happy 1968.—**George R. Wadleigh**, Acting Secretary, 70 Flower Avenue, Hastings-On-Hudson, N.Y. 10706

98

In memoriam, **Edward T. Foulkes**, bachelor of science degree in Course IV, Architecture. His daughter, Mrs. W. C. Anderson, wrote as follows: "Your kind letter to my father, Mr. Foulkes, was given to me to answer. Dad passed away on December 10, 1967, at the age of 92. He was a practicing architect until he was 89, and he did much to change the skyline of Oakland, Calif. He left two daughters and four grandchildren—three are mine and one my sister's. We have always been extremely proud to be 'his family.' He valued his years at M.I.T. greatly, and he often spoke of them and of the fine friends he made there. Sincerely, Phyllis Anderson,

7 Camino Lenada, Orinda, Calif. 94563. The Class of '98 extends sympathy to you, Mrs. Anderson, and to the other members of the family.—**Mrs. Audrey Jones Jones**, Acting Secretary, 232 Fountain Street, Springfield, Mass. 01108

99

Charles F. Harwood was born November 7, 1875, and died in February, 1967. Notice of his death was not received until many months later. He was engineer in the Condenser Department, International Pump Company, New York. Charles wrote an interesting letter in 1964 regretting that he was unable to accept my invitation to attend the 65th Reunion of '99 at my home, as he was then 89 years of age, but he was very interested in '99 and M.I.T. His daughter, Mrs. Madeline Harwood Conro, wrote that her father enjoyed everything until just before he passed away.—**Percy W. Witherell**, Secretary, 1162 West Street, Wrentham, Mass. 02093

01

Charles Auer, 902 Park Road, El Paso, Texas, reports: "I am 88 years old and my wife is 85. Our daughter married and has one son, Irving, who is now married and the father of three children." . . . We regret to report the death of **George W. Allen** of East Bridgewater, Mass., on November 25, 1967. After his graduation from M.I.T., George worked for the B. F. Sturtevant Company and was later employed by Westinghouse where he stayed for 45 years until his retirement. The Class of 1901 extends its sympathy to the Allen family.

03

Another distinguished classmate of 1903 has passed from our ranks, **Leroy Livingstone Thwing, II**, of Cambridge, Mass. He and Mrs. Thwing were present at our memorable 60th Class Reunion. He died at his home on Sunday, December 17, 1967. Roy was born in Somersworth, N.H., May 28, 1879. He prepared for college at

Phillips Exeter Academy and after graduation entered M.I.T. and graduated in 1903. Roy followed his engineering profession with an office in New York until 1929. He then became interested in research which assumed a leading role that shared a major portion of his life. This field encompassed several years with the federal government and embraced both civic and historical matters of national and international concern. His lengthy research association with the New York Museum of Science and Industry laid the foundation for his many writings on historical matters. Roy was Editor of *Rushlight* magazine and wrote for many trade journals. He was the author of *Flickering Flames*, a fully illustrated history of primitive illumination devices and the later progress made in this field. The book has been recently revised for its second edition. He translated into English *Old Lamps of Central Europe* by Von Benesch, the original title of which was *Das Beleuchtungswesen*.

Though retired for some years, Roy's interest in local civic and historical matters was always evident. He was a member of the Columbian Lodge, A.F. and A.M. of Boston. He leaves his wife, Mrs. Edna (Wilson) Thwing and a brother, Albert, of Montreal, Canada. . . . Not one of our classmates has a birthday to celebrate this month. . . . We received news from the family of **Marshall H. Washburn**, X, that he passed away March 18, 1967, at 537 Barberry Lane, Louisville, Ky. He spent many years involved in a busy career before retiring from his position as Assistant District Manager, Standard Oil Company, Louisville.—**John J. A. Nolan**, Secretary, 13 Linden Avenue, Somerville, Mass.; **Augustus H. Eustis**, Treasurer, 1428 Canton Avenue, Milton, Mass.

04

We, unfortunately, only have deaths to report as news this month and also a few items on classmates whose passing was reported in earlier issues of the *Review*. . . . Several months ago we mentioned that **Robert Sosman** had died but no further details were available at the time. An article appeared in the *New York Times* on his death and told of the many accomplishments of Robert Sosman, one of which was the Albert Bleining Award in 1953, the nation's highest honor in the ceramic field, which he received from the Pittsburgh section of the American Ceramic Society, of which he was President in 1937. He was a co-originator of the Day and Sosman high-temperature scale, established in 1912, and the author of *The Properties of Silica* published in 1927 and the more recent *Phases of Silica*. He was Physicist and Assistant Director of the Geophysical Laboratory at the Carnegie Institution from 1908 to 1928 and Physical Chemist and Assistant Director of the Research Laboratory at United States Steel Corporation from 1928 to 1947. He

was a consulting chemist of the Army Ordnance Department in 1918 and a lecturer on geophysics at M.I.T. in 1925-26. A former Chairman of the New York Chapter of the Appalachian Mountain Club, Dr. Sosman was the seventh person to travel the entire Appalachian Trail from Maine to Georgia. From 1942 to 1962 he privately published *Gustavademecum*, a "scientific guide" to restaurants of Manhattan which he circulated among scientists.

Further on the death of **Arthur Smith** of Orangeburg, S.C.—he was an oil technologist and patent attorney. He was Associate Editor of Day's *Handbook of the Petroleum Industry* and later Resident Engineer for Cory Brothers and Company, Ltd., London, England, from 1922 to 1927. He was Petroleum Technologist for Jenkins Petroleum Process Company and later served as Vice President of the company. He was admitted to practice by the U.S. Patent Office in 1932. . . . Another death we have to report is that of **George Curtis** who died recently at the home of his son in Needham, Mass. He had lived in Pittsfield for 56 years where he had been District Engineer for the Department of Public Works.

We have received word from Mrs. Stanislaus Skowronski of the passing of her husband, our classmate, **Stanislaus Skowronski** of Metuchen, N.J., on January 19, 1968. . . . Your Treasurer received a letter from Lenore Carty, wife of **Frank Carty**, telling of the death of the Carty brothers, Maurice and Frank, who were the twins of our Class. They both were graduates in mechanical engineering. Frank's wife writes as follows: "Maurice, who lived in Chestnut Hill for many years, died on July 26, 1967, after being in ill health for about a year. He was associated with Stone and Webster Engineering Corporation. for many years. Frank died on November 27, 1967. His passing was sudden, after a sickness of only a week. Frank was a railroad man, having been with the Boston and Albany Railroad for a long, long time. Though neither one of the twins had been in good health for quite a while before their deaths, they were up and about and mentally very keen and alert to the end. It is sad to have your numbers dwindling but we in this family think we were particularly blessed to have had Frank and Maurice with us so long. They would have been 86 on January 10, 1968."—**Eugene H. Russell, Jr.**, Secretary, 82 Stevens Road, Needham, Mass. 02191

05

At this time of the month it is sometimes a puzzling question—whether to skip the class notes due on the 10th or to dig down into the files, work up some statistics or invent a scandal about some octagenarian classmate (so as to have one letter, at least next month). I hate to pass, so here goes. . . . I am looking at a newspaper picture showing

the stars in the new and widely advertised motion picture *Guess Who's Coming to Dinner*. The stars are Katherine Hepburn and her niece, Katherine Houghton. I have occasionally mentioned that Katherine Hepburn is the daughter of our **Katherine Houghton, IV**. It is now playing Boston and we hope to get a chance to get down to see it. You must see it—we so seldom get a chance to get close to those we admire on the screen—call it the old '05 spirit. . . . Looking back through some old '05 photograph albums, pictures and souvenirs of the "Tech on Boylston Street," I found again newspaper clippings, in fact whole issues of the *Boston Journal*, *Globe* and *Post* printed the day after the Tech-Police riot. Anyone remember that night? This melee followed a Roosevelt rally and torchlight parade (November 3, 1904). The Harvard contingent had been shunted across Harvard Bridge (to avoid a Harvard-Tech clash) and "the M.I.T. boys started to climb Rogers steps for their customary cheering, and all" only to find the steps occupied by an array of Boston's "finest" with instructions (from their superiors) to keep the steps clear. That was hallowed ground and there followed a lot of fierce fighting, the police in their iron hats using their "billies" viciously. We, without means of defense, fought back valiantly. Several on both sides were hospitalized. I remember a barked shin and a lump on the head. At a hearing before the Police Commissioner several officers were demoted, but their brutality was "whitewashed" on the grounds that the Commissioner was instructed by M.I.T. officials to keep the steps clear; this President Pritchett and Dean Burton strongly denied. The story of police brutality travelled nation wide. Remind me about June 1 to take my memorabilia to our table at the Alumni Day Luncheon on June 10. I particularly prize a dirty piece of cloth torn from a torchlight banner with the inscription "Tech stands for the strenuous life."

The above may not legitimately be considered class news, but to avoid wandering into alien subjects in the future, sit right down and write me some news of yourself or some classmate you have seen or heard from. . . . I have a letter from Beatrice and **Leonard Cronkhite**, again extolling their winter "Shang-Ri-La" at Green Valley, Ariz. Their "come on out" was very intriguing, but we had to say (with tongue-in-cheek), "Sorry, but we're enjoying Winter-wonderland too much." —**Fred W. Goldthwait**, Secretary, Box 32, Center Sandwich, N.H.

06

Several classmates have been escaping the rigors of our New England winter by moving down to Florida for a few months. . . . **George Guernsey, VI**, seems to be in Sarasota for keeps and **Frank Benham** has spent six months or

more at Daytona Beach for many years. . . . Late in December **John Wrinkle**, IV, and his wife Mary flew down there from Bradley Field. Their son and grandson drove the car down for them to have during their stay. They are planning to return in April to their home in Mill River out in the Berkshires. They have been spending the winter at Daytona Beach since John retired and I have a photo of them taken there—with a palm tree in the distance. John and Mary have two married sons, two married daughters and 24 grandchildren. . . . **George Shingler**, V, is now a permanent resident of Lake City, Fla., Box 3036, where he is "retired but can walk a couple miles a day." . . . **Stod Pulman** is in a convalescent home near Glastonbury, Conn., we learned from his daughter-in-law, Mrs. Donald J. Jordan, with whom Mrs. Pulman is now living. . . . On January 25, 1968, we lost our oldest classmate, **Andrew Kerr**, VII, who died in the V.A. Hospital in Providence, R.I. **Howard Barnes** had spotted the obituary notice in a Plymouth paper and sent it to me. The notice included some details I did not have. Howard said he had attended the service in Plymouth, but none of Andy's relatives nor the scheduled minister were present because of illness. A few veterans from the Cape also attended. The only surviving relatives are three brothers. Andy was born in Nova Scotia in 1879, but I have nothing about his early life until he lived in Medford, Mass., while he was with our class during our first two years. He took Course VII, Biology, which then included public health and food technology. That course selection would indicate that Andy even then was interested in food—clams! According to my sources, in 1913 Andy was President and General Manager of the Andrew Kerr Company of Plymouth and in 1920 was a packer of canned foods. From 1925 on his address was Barnstable (the Andrew Kerr Company on Crocker's Wharf), being Senior Partner in the '30's and President and Manager in the '40's. In 1955 he retired to 81 Warren Street, Plymouth, and a year or so later he married Clare B. Litchfield. In May, 1957, I had a note from his wife that Andy was in the Roxbury Veterans Hospital with a heart attack, and in October, 1960, he was there again with a third attack. His wife died a month later. Andy was a veteran by virtue of his service in Cuba during the Spanish-American War, as a corporal with Company E, 5th Massachusetts Infantry, U.S.V. Another classmate **A. H. Keleher** (deceased) served in the Philippines in that war. **Andy Kerr** was one of our most loyal and interested classmates; paid dues frequently thru the years; attended Reunions in '31, '36, '41 and '51, and he came to Charter House for our 60th in Cambridge. He lived a long and rewarding life.

In January we received notice, through the Alumni Office, of the death, on September 15, 1967, of **Spencer Alexis**

Cutting, V, probably in Arizona. Spencer was with us for part of our first and second years when his home address was Oak Knoll, Winchester, Mass. We have no information prior to that and not much since then. By 1920 he was lumbering and his address was St. Regis Falls, N.Y., and by 1930 was in motor trucking, with several New York addresses through the years until he evidently retired to Casa Grande in Arizona by or before 1956. In June, 1960, Spencer, in a note to Jim, said he was home from the hospital after a shock—"the fourth in the last four years."—**Edward B. Rowe**, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02181

07

"Ashes and memories—that's all there is now." I am sure this will come as a shock to many of the 1907 men now living. I am writing of the Oyster Harbors Club House, where we enjoyed its hospitality during ten Class Reunions. It was completely destroyed by fire during January. This building was erected in 1927-28 at a cost of \$119,000. To replace it today would take more than one million dollars. Much of the lumber was cut on the island on which it stood. The clubhouse was considered an architectural gem at the time it was built. It was a three-story structure and included a ballroom, cocktail lounge, office area, lobby, dining room and a 60-room sleeping area. The Club has been host to names like Du Pont, Bruce, the Mellons, Kennedy; movie stars like Spencer Tracy, Katharine Hepburn, and Errol Flynn. In the late 1930's, Lily Pons and Andre Kostelanetz elected to honeymoon at Oyster Harbors. The Class of '07 held their regular five-year Reunions there from the 25th through the 55th and also three intermediate gatherings. It had been decided last summer to raze the building and erect a smaller clubhouse on the same site. This work was in process, the removing of doors, windows and all usable material, when a fire was started; and within a short time, nothing remained except "ashes and memories." . . . Please note the following changes in address on your class list of living members: **Bill Otis**, Forest Beach Road, South Chatham, Mass. 02659; **Frederic Menner**, 1150 East Village Road, Santa Barbara, Calif. 93103. The winter address for **Maurice Pease** is Starfish Avenue, Seagate, Naples, Fla. 33940.

A card from **Roland Willcomb**, III, gives the following information: "Enjoying healthful retirement on wooded acreage facing Hood Canal and Olympic Mountains near Bremerton, Wash. Continuing my interest in photography, lapidary and mycology, as well as maintaining a vegetable and herb garden. First wife died 1961. Remarried 1962. Four married daughters; 10 grandchildren; three great grandchildren." . . . In the March Review

I mentioned the death of **Franklin O. Adams**. Miss Adams answered my letter of sympathy and sent the following information: In 1914 Frank moved to Tampa and set up a practice of architecture. Among the buildings which he designed are McKay Auditorium, Plant High School, Plama Ceia Presbyterian Church, Davis Islands Swimming Pool, Culbreath Memorial Chapel of the First Baptist Church and some of Tampa's largest public housing projects. Nationally known, he was a member of President Hoover's Building Congress and President Franklin Roosevelt's Construction Appeals Board under the National Recovery Act. In 1940, the year in which he originated Tampa's first zoning law, Frank was awarded a fellowship by the American Institute of Architects. He was a member of A.I.A.'s Jury of Fellows six years and served on the Institute's national Board of Directors three years. He was a member of the Municipal Housing Committee, upon whose study Tampa's lowcost Negro housing projects are based, and served on the mayor's committee to select a site for a municipal airport. During the mid-1920's, Frank proposed the construction of a causeway with locks across the lower end of Tampa Bay, which would have converted the entire bay into a fresh water lake. Frank retired about 10 years ago. He had a son who was a life-long invalid and required all of his attention. The son died three months before his father. Frank was a member of the First Methodist Church and a fraternity brother of Kappa Alpha. He is survived by a daughter, with whom I corresponded, a brother in St. Joseph, La., and two sisters.

Jim Barker noticed the death of **Earl H. Reed**, IV, in the *Chicago Tribune*. He cut out and sent me the obituary notice. I have not had, and neither did **Bryant Nichols** have, any communication with Earl for the past 20 or more years. There is no record of his having ever attended any of our Class Reunions or alumni gatherings. He evidently held a very important place among the Chicago architects, and we should be pleased to note another '07 man who has made a definite contribution to the age in which he lived. I wrote a letter of sympathy to the family, which consists of Mrs. Reed, three daughters, a brother, and three grandchildren. His death occurred on January 28, 1968, in a nursing home in Chesterton, Ind., at the age of 83. Earl was the dean of Chicago architects and was an authority on architectural history, particularly the Chicago school. A practicing architect since 1914, having previously attended the Beaux Arts in Paris, he served as Chairman of the Department of Architecture in Armour Institute of Technology from 1924 to 1936 and was Chairman of the American Institute of Architects National Committee on Historic Buildings from 1951 to 1962. Earl was a member of the Board of Trustees of the Chicago School of Architecture Foundation. During the last five years he supervised the historic Ameri-

can Building Survey for the National Park Service in the Chicago area. He received numerous awards including the gold medal of the Chicago Chapter A.I.A. in 1965 for distinguished achievement as an architect, educator, and historian; and, in 1961, he received the Edward C. Kemper Award for dedication to the preserving of historic architecture. Earl served on the Advisory Board on National Parks, Historic Sites, Buildings and Monuments set up by the Secretary of the Interior from 1957 to 1963 and was awarded a citation for meritorious service. This is twice recently that Jim has helped the Secretary out in obtaining news for our '07 column.

I had a nice note from **Hud Hastings** and his wife. They celebrated their 60th wedding anniversary December 18, 1967, with a family gathering at which their four children, several grandchildren and Hud's brother, Russell Hastings, '09, attended. . . . **Don Robbins**, as Estate Secretary for the Class, got out an interesting letter to accompany the brochure *Life Income Plans at M.I.T.* which we all recently received in the mail. We of '07 have all reached that time of life when the proper disposal of our worldly goods, either large or small, is important; and I suggest you give it your careful attention before it is too late.—**Philip B. Walker**, Secretary and Treasurer, 18 Summit Street, Whitinsville, Mass.; **Gardner S. Gould**, Assistant Secretary, 409 Highland Street, Newtonville, Mass.

08

60th Reunion; Melrose Inn, Harwichport; June 7-10, 1968; for reservations: H. Leston Carter, 14 Roslyn Road, Waban, Mass.

Our 60th Reunion will be held June 7-9, 1968, at Melrose Inn, Harwichport, Mass., on the Cape. Plan to be with us and see the old crowd. Headquarters will be the Beach House as usual. June 10, 1968, is Alumni Day at Cambridge—**H. Leston Carter**, Secretary, 14 Roslyn Road, Waban, Mass. 02168; **Joseph W. Wattles**, Treasurer, 26 Bullard Road, Weston, Mass. 02193

09

In the March *Review* it was stated that **Art Shaw** had received a letter from **Edward D. Merrill** from Washington, D.C., relative to an award to **Morse Rew**. Inasmuch as we had not heard from Edward since he retired as President of the Capital Transit system, we asked him to tell us something of his present activities. He writes: "Thank you for your letter of December 18. Glad to know the information about Morse Rew reached you in time for the March *Review*. You ask about my situation now. In 1951 I retired from my position as President of the Capital Transit Company here. It was an interesting assignment, especially during the war years. My experience since 1913 has been in

the urban transit field in various cities beginning in Seattle, Wash. I regret having to retire when there is a great revival of interest in and appreciation for public transportation! We are fortunate in having a daughter and son-in-law living nearby and two grandchildren—one (granddaughter) a senior in Pembroke College and the other (grandson) a senior in St. Albans School here. It is good to have the younger generations to keep us awake!" . . .

Elliot Q. Adams has advised us that his new address is: 17444 Trillium Drive, Bainbridge, Ohio 45612. . . . **Rea Blankenbuehler** received the following letter from R. S. Howes: "Mrs. Beers requested that I write you to inform you of the sudden passing of your friend, **Louis Gilbert Beers**, on December 25, 1967. Mr. and Mrs. Beers were visiting with us for the Christmas holidays and Mr. Beers had a massive shock on December 23. My wife, Mrs. Beers' daughter Betty, is presently in Taunton to stay with her mother for several weeks." . . . Rea sent the letter to **Mex Weill** for his information and also with the request that he inform the '09 Secretary. We wrote immediately to Mrs. Beers expressing the sympathy of the Class as well as our own. (We knew Louis personally very well.) Louis was born May 24, 1887, and prepared for the Institute at Taunton High School. He was in Course X, a member of the Chemical Society and his thesis was "Artificial Coloring Matter in Food Products." Our records have nothing of his career and activities since graduation except that his residence was in Taunton. Mex's letter was written on his business stationery with a letterhead "Skydyne, Inc., Port Jervis, N. Y., Research, Design, Development and Manufacturing to Solve Specific Problems." Mex is now Chairman of the Board—**Chester L. Dawes**, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; **George E. Wallis**, Assistant Secretary, Wenham, Mass. 01984

10

Ernest L. Patch writes from Richmond Upon Thames, England: "Upon a rather late decision of Mrs. Patch and myself, we flew to England to spend the season's holidays in and near London with her son (my stepson). I am affiliated with the Class of 1910 as I attended M.I.T. in 1906-07 school year as a freshman. I also graduated from the Special Navy Postgraduate Course for Naval Construction 1913-1916." . . . **John G. Ahlers** of Moses Lake, Wash., writes: "Since 1952, when I came back from a tour of duty with the Foreign Service in Italy, my life has been wrapped up in the Columbia Basin Area which I admired all the years since Franklin Roosevelt started the Coulee Dam and its appendages. I went with the Bureau of Yards and Docks, by reason of my acquaintance with Admiral Morrell, in 1939 and after the war broke out was commissioned Commander C.E.C. and had plenty of overseas duty in Greenland, Europe and

Brazil. I fitted in with the Foreign Service Program and after 1947 spent five years with duty first in London and then in Rome, Italy, where I built a new addition to the Embassy, new apartment housing and a new Consulate in Naples. Then I came out here and built my own pioneer log cabin (but of concrete) and opened my engineering office. I have done very well and my one pet project is a 1/16 ownership with four other men, we took a section of land down on the Rogue Slope and I have done all the engineering and had a wonderfully busy time and want to retire."

Walter S. Davis writes: "I have had many trips abroad—Europe, Asia and Africa. I have only been to Boston once, or perhaps twice. I am now living, as you know, in Palos Verdes Estates, Calif., which as Assistant City Planner I largely laid out. As an architect I've been a failure even though my brother Rupert and I have a church in the *Encyclopedia Britannica*, I have become a landlord and have found it satisfactory, giving me trips abroad. Indeed, from '28 to '31 we lived in France, chiefly on the Riviera at Juan les Pins." . . . **Jack Babcock** writes: "**Hal Manson** has asked to be relieved of his job as Class Estate Secretary. After conferring with **George Lunt** I have written to **Walt Spalding** and he has accepted the office. George Lunt is now in the South for a month or more."—**Herbert S. Cleverdone**, Secretary, 120 Tremont Street, Boston, Mass.

11

Feeling that most Eleveners are as interested as I am in the doings of their classmates, I have been trying to get stories from a number that I have written to personally. . . . Last month's notes had **Jim Campbell's** story and this month **Morris Omansky's**. Morris was born December 24, 1889, in Kiev, Russia; prepared for M.I.T. at the English High School in Boston and graduated from Course V, Chemistry. Following graduation, he worked briefly for New England Show Case Company, New England Building Finishing Company and Emblem Jewelry Manufacturing Company; then from 1911 to 1917 as Chemist for the Boston Woven Hose and Rubber Company; from 1917 to 1920 for the Plymouth Rubber Company; from 1920 to 1922 as Chief Chemist for the Needham Tire Company; then back as Chief Chemist from 1922 to 1924 at the Plymouth Rubber Company. He started his career as consultant and expert witness in litigation and patent cases in 1920, and maintained an office in Cambridge for many years until his retirement a little over a year ago. Morris had among his clients many well known companies including: the Barrett Company, New York; Hood Rubber Company, Watertown; Dunlop Tire and Rubber Company, Toronto, and many others throughout the country. His consultations have been on a wide variety of subjects closely related to chemistry. He has given expert testimony in patent and damage suits and has

given assistance prosecuting patent protection. Until his retirement Morris was a member of American Institute of Chemical Engineers and he is still a member of the following subdivisions of the American Chemical Society: Rubber Chemistry, North East Plastics Group, the New England section of the Society and the Colloid Division. He is a member and Fellow of the American Association for the Advancement of Science. Morris and his wife Ricca live at 9 Babcock Street, Brookline, Mass. 02146, and would be greatly pleased to hear from any classmate. They have one grandson at M.I.T. and another at Harvard.

Paul Cushman has moved to 6001 Smith Boulevard, Oklahoma City, Okla. 73112. Along with his contribution to the Alumni Fund, Stuart Copeland wrote: "Have just completed my 10th year of retirement living and both my wife and I are thoroughly enjoying it." . . . From Lois Stevens Streett "On behalf of my grandmother, Mr. Lester F. Stevens, I want to thank the class for the beautiful arrangement of flowers you sent to her for her 100th birthday. M.I.T. and 1911 meant a great deal to grandmother and she was so pleased to hear from all of you." . . . A letter from **Wellesley Seligman** started "not intended for publication," so I'll not quote directly from it. Since his wife died in 1963, he has been living in rented apartments and for the most part eating out. While winters are good in south Florida, summers are not, so he makes a trip north each summer. He has an 18-foot boat with an outboard motor in which he does "small fishing with lures, no bait." He would be glad to be of assistance to any classmate who might be down his way. (Hallandale, Fla.). . . **Lloyd Cooley** wrote me that he drove east a couple of years ago and while asking directions to his brother Harold's home he ran into **O. W. Stewart** in Kingston. He is in good health and has not retired yet but works every day making "take-offs" and estimates of items which are sold to heating contractors. Lloyd sent along an account of a trip he and his wife took last fall as part of a group, from which the following information was taken: on their flight to Tokyo they made a stop at Anchorage, which they found bleak with snow on near by mountains, and they lost a day at the international date line. They found Tokyo warm and dingy, saw some ornate temples and the Olympic swimming pool with its suspended roof. A fast comfortable train took them to the pretty resort, Nikko. Kyoto, with wide streets, was more attractive and they were able to photograph a Japanese bride in her finery. On to Taipei, Formosa, where they found, as in all Oriental countries, the stores and homes were small and there was poverty and congestion everywhere. Next, they visited Manila, warm and steamy, with Taal Lake and an extinct volcano, then to Corregidor. During five days in Hong Kong, Lloyd bought a heavy English suit and red silk sports jacket and Treva did some shopping on her own, all at reasonable prices. They took a motor junk ride around the

Island of Aberdeen to a huge floating restaurant, passing women beggars sculling sanpans and holding out pans for money. There is much housing being built in Kowloon and New Territories, but still a lot of land left. What happens in 30 years when the British lease on the territory run out? In Singapore, near the equator, there are many East Indians in trade. While there, the tour agent hired a private home and grounds where a fine party with native entertainment was held. The main points of interest in Bangkok are the palace and water markets along the klongs. The buildings in the palace grounds are really something, much gold leaf and bright colored tiles. Lloyd attended a Siamese boxing match where they kick as well as punch. People live in shacks jutting out into the muddy canals. Little sanpans scull along selling cooked food, some of which looked clean and appetizing. They flew home with a day's stopover in Hawaii for swimming.—**Oberlin S. Clark**, Secretary, 50 Leonard Road, North Weymouth, Mass 02191

12

The following **Do you remember** story of days at Tech was contributed by **Arch Eicher**, the first received so far. We would like to include some such story in each issue. "**Do you remember** our freshman military science with its drill periods and the marching band? I do—with many pleasurable chuckles! There was wild scouting among many new classmates to find a uniform which came close to fitting. Some of us had to make adjustments to the misfits and hand-me-downs in all directions. Others had to paint their old tan shoes black to pass inspection. The odor from the stain was strong and everlasting. White gloves required lots of talcum. On entering the armory we could hear the toots and high-pitched notes from the practice quarters. Anyone who claimed to be a musician might qualify and thus escape drill. Major Wheeler evidently did not consult with the Conservatory of Music when conducting the qualifying trials. After we had made an effort in military drill the band emerged and paraded before us. We in front tried to maintain dignity but the suppressed comments and snorts from the rear ranks were far beyond anything found in textbooks! As the procession passed, Major Wheeler leading with a thump-thump, the Armory resounded to the strangest music this side of Heaven! We were grateful to the bass drummer who squashed the foul notes with good timing. Oh, yes! It finally dawned on us that they were playing, 'Stars and Stripes Forever.' I remember one comment, 'Poor Sousa!' That band was still on hand when we had our Class Picnic after graduation but evidently there had been little time for practice during the four years. Undaunted, they presented sundry new and sometimes wierd tunes to thrill us." Thank you, Arch, for starting the ball rolling. It seems well to add a sequel

to this story. Having served as an officer in a high school drill corps I was made one of the four first sergeants of our freshmen companies. Our sole duty was to call a company roll and file a report of absentees, following which we promptly repaired to the guard room in the basement where we spent two hours playing bridge while we listened to the tread of feet and the blare of the band from the drill hall above. Occasionally, we had to take charge of an awkward squad after the drill. Nevertheless, we rated this job among the best in the freshman course.

We regret to report the sad news of the passing of **Macaulay Costner** on August 11, 1967, in Coral Gables, Fla., where the Costners have been living since his retirement. Our sympathy was forwarded to Mrs. Costner in behalf of the Class. . . . A most interesting Christmas letter arrived from Marjorie ("me, too") and **Cy Springall** who have a home on a four-acre wooded tract in Andover, Mass. Despite repeated hospital visits, Cy continues to be one of our most active members and has never missed a Reunion. In fact, he was forced to observe their 40th anniversary in the Deaconess Hospital last April but a few weeks later he had bounced back sufficiently and was with us in Cambridge, after which the Springalls went to their summer home in Dexter, Maine. They spent a week during the last part of August at Marjorie's sister's apartment in St. Louis, following which the two couples took "a combination plane and Hertz trip, filled with 'ohs' and 'ahs,' through the Grand Tetons, Yellowstone, Bear-tooth Mountain Highway with its glaciers and multiple switchbacks, Estes Park and Colorado Springs. We then ran the gamut from the Air Force Academy, Cripple Creek with the old time gold mines, Mount Pisgah with the ultimate in mountain roads, Phantom Canyon with its narrow winding river bed flanked by sheer cliffs, the Royal Gorge with its deepness and steepness, to the awesome Garden of the Gods. We hope that some of our classmates will visit us in Scottsdale, Ariz., where we have a large apartment until the end of March. Our address appears in the November news. Last year our son Tom joined us and took us for a trip over mountain trails which made Marjorie dizzy. She sat on the back seat and always managed to be on the up side with surprising agility. But we did manage to see much of interesting Arizona, such as the wild town of Tombstone, the huge Lavender Copper mine, Kitts Peak Observatory, the unique Desert Museum and Mount Lemmon. Later we visited Grand Canyon in a snow storm, Oak Creek Canyon, Indian villages, the Apache Trail and the wonderful Roosevelt Dam, which makes life possible for Phoenix, Scottsdale, Mesa and many other towns. Doesn't this make you want to come and see us?" It surely does, Cy! More power to you and better health.

Hamilton Merrill writes: "Since graduation in 1912 I've led a varied and full life. Needing sales experience, I first went with General Electric selling supplies. After that I went from one kind of job to another, each lasting from 10 to 18 months but this gave me valuable experience. I was Secretary to a wealthy banker, Supply Salesman and Engineer at a Demonstration Pilot Gas Cracking Plant for the Texas Company with **Louis de Florez**. When the War started I obtained a commission in the Chemical Warfare Service under Bradley Dewey and was sent overseas in liaison work with the British Anti-gas Department. After the War I went to St. Louis to run an ammonia plant and a year later joined the American Steam Gauge and Valve Manufacturing Company in Boston. I was soon transferred to Newark to run a dye plant (Tower Manufacturing Company) owned by the same interests. When that was sold I was sent to Brooklyn to run the American Shaefer and Budenburg Company. This organization was bought by Manning, Maxwell and Moore in 1928 and I moved the plant to Bridgeport where I operated the combined plants. In January, 1956, I retired as President of this organization which then included seven plants and 4,000 employees. I am now a Director in two banks and an active Trustee of the University of Bridgeport, a fast growing institution of 8,600 students, where I am serving as Chairman both of the Committee on the College of Nursing and of the Estate Planning Committee. I also served as Vice Chairman of the Fairfield Finance Committee for six years. On October 12, 1921, I married Phyllis Gordon of Chicago. I have two married daughters and nine grandchildren, four boys and five girls. One granddaughter is married and now finishing at Briarcliff College, another is at Simmons and a third attends Emma Willard. One grandson is at Colgate, the second at Cornell and the third hopes to enter Tech this fall. We are both in good health, age considered, and get a lot of fun out of life, which includes church and social and community activities. We enjoy swimming and play bridge. Since retirement we have travelled extensively every year in Europe and Asia and also spent some time in Central America, where we were interested in Mayan and other cultures. In Asia we found time to explore the various cultures and religions. We have attended practically every Reunion since my 20th and it is always nice to see the old gang."

A brief note on a Christmas card from **Jim Cook** in his inimitable style seems worth repeating: "Am happy to report that I am living and am exceedingly busy doing nothing worth talking about. Plan no skiing or ballet dancing during this season." You guessed it—I'm still trying to get the story of Jim's past activities and present interests but it's hard to wear him down. . . . **John Hargrave** replied

immediately to our request for news. We appreciate his comments regarding the tribulations of a class secretary and hope that others will help with a contribution. He writes: "You are in a tough spot, though it would seem to be mostly your own fault even though you may like to write more than I do. I hope you do not have to do all of your typing. Here goes! In 1912 I received a diploma, which has since been lost, stating that I was a qualified B.S. in electrical engineering. But now when my door bell needs fixing I know enough to call an electrician. Some of the training must have stuck, however, for soon after graduation I started to work in a small tool plant. I ran that business for 42 years and never had a strike. That is my only claim to fame. Some say it was all luck, maybe so. My roommate at Tech had a very nice sister who married me in 1915. We have three married daughters and nine grandchildren, three girls and six boys. The two older boys are now at Dartmouth. In 1954 I sold my business and we retired here in Thomasville, Ga., to live on a farm. However, I soon tired of mechanics who reached for a hammer when any machine went wrong so I sold the farm and we moved into town across the road from a good golf course. We did some traveling and took one trip around the world where we had the pleasure of meeting **Jesse Hakes**. We have made several trips to Manila, where one of our daughters was living, and have also visited Hong Kong and Japan. We made a trip around South America by air; that is the way to travel. Our last trip was to Boston in 1962. Now my arthritis prevents golf and we no longer particularly enjoy travel so we have just been loafing for the past five years. Well, Ray, that is about all; there isn't any more. I hope the New Year treats you well and that you will have good luck with the rest of our classmates."

I have received news regarding **Chester Dows** from Warren Henderson, '33 Class Secretary, who is a close friend. Chester worked for 40 years with the General Electric Company, Nela Park, Cleveland, and retired in 1952. Last May, when he was at his summer home in Madison on Lake Erie, he had a severe accident when a dog ran between his legs and tripped him. The femur bone of his left leg was broken and he was confined to a wheelchair all summer. He is now able to get about with a cane and can drive his car around town. We wrote him in January, sending our sympathy and the wish that he may fully recover. He replied promptly to our letter stating that he is continuing to improve. . . . I am particularly pleased at the response of classmates to our request for news. With your help we hope to be able to continue to publish at least three columns per issue but realize that this is a rather ambitious program. . . . Helen and I have been enjoying most comfortable weather this winter in Bradenton, Fla., including several springtime training baseball

games. We expect to leave for home soon after the first of April.—**Ray E. Wilson**, Class Secretary, 304 Park Avenue, Swarthmore, Pa. 19081; **Jay H. Pratt**, Assistant Secretary, 937 Fair Oaks Avenue, Oak Park, Ill. 60302

13

55th Reunion; Coonamessett Inn, Falmouth; June 7-10, 1968; for reservations: George P. Capen, 60 Everett Street, Canton, Mass.

The Fiftieth Reunion of the Class of 1913 will be held at Coonamessett Inn in Falmouth on Old Cape Cod, Friday, June 7 through Sunday, June 9, 1968. Are you making plans to be with us? . . . **Arny and Larry Hart** hope to be present. . . . **Phil Burt** writes: "I am living in Yarmouth Port, on the Cape, and expect to attend the Reunion but will probably live at home." . . . **Warren Gentner** states: "I would like to attend. Just returned from a lengthy visit with my daughter in Denver, where I made the acquaintance of a great-grand daughter. Now I know I am getting old." . . . **Ellis Hartford** contributes: "Am still living but not very active at present. Hope you are well." . . . **Arthur Howlett** states: "Sorry, but I cannot attend. Best regards to all." . . . **Arthur Hirst** sends a cheerful comment: "At my advanced age I can't look far enough ahead, and although I am in pretty good shape now, by next June I may be where I don't have to pay for oil to keep warm. Later I may see my way clear to spend a day or two with the mob." . . . **Clarence Brett** writes: "Always good to hear from you. Nothing much new here, just trying to grow old gracefully. Ruth has been having a little trouble with some sort of virus but is coming along o.k. We plan to go to Scottsdale, Ariz., before Christmas to be with some of the family for a while. I keep busy with municipal affairs and keep out of mischief. Have been a member of the Planning Board for about 20 years and Chairman for the last several years—always something doing there. I certainly hope to attend the 55th." . . . **Warren Glancy** adds: "Hope to (attend) for at least a day."

Lindsley Hall has written twice and we shall quote him in part: "Of the original group who worked in the Tomb of Tut-ankh-amen, 1922-1923, I appear to be the sole survivor. As a member of the Metropolitan Museum of Art, I was lent to Lord Carnarvon and his archeologist Howard Carter when Carter made his spectacular find in the Valley of the Kings. I was put to work making a plan of the main chamber of the Tomb with all objects in position as found. With me in the work was my colleague, the late Walter Hauser, '14. I was retired from my work in the Metropolitan Museum 18 years ago and I live in my home town, Portland, Ore. Last year I visited my school friend **Henry Glidden**. I have looked in vain for my Tut-ankh-amen story which

I thought would make interesting reading. Were it not for M.I.T. I would never have had the experience. I can, however, give you something that you asked for, that is news of **Louis C. Rosenberg** whom I have known for 60 years. In his retirement, which started only about four years ago, he and his wife returned to Portland, his old home city, and settled in a very nice house at Lake Osewego. Last year his wife died and I have seen nothing of him since. He is now on a tour of the Mediterranean. I shall hope to see him on his return." Many apologies to you, Lindsley, for not using your interesting story before now. Also, thank you for your news about Rosenberg.

Ed Pratt has some wonderful ideas regarding international relations such as forming a "World-wide Student Council" with your Secretary and the Secretary of the Class of 1923 conferring with Dr. J. A. Stratton, '23, and other noted educators and student leaders to guide the activities of most of the college bodies in the English countries. Your Scribe is forwarding Ed's letter to the Editor of the Review for his comments or action. . . . **Charlie Brown** always keeps the Class informed of his activities. The present publicity Charlie must be receiving with that television show should be gratifying but our Charlie does not look like the mythical "Charlie Brown." Our Charlie made a hurried trip to Massachusetts in October to settle certain commitments as requested by his deceased wife Helen. . . . A very sincere and optimistic letter was received from **Jack Farwell** regarding the attendance at our 55th Reunion and we quote in part: "Any thirteener who checks 'do not expect to attend' must be in one hell of an awful situation, health or otherwise, not to be able to say 'yes' at this time. For myself, I expect to start immediately living a more careful life, how I don't know but no reduction in eating or drinking, in order to be in circulation, either with or without assistance, in June, 1968. I will check in at the 55th Reunion so will see you then, Phil." . . . **J. B. Ladd** writes: "Sorry, I will not be able to attend the Class Reunion. It is rather a long way from Florida to Cambridge. We have been down here about five years and in that time haven't strayed more than 40 miles from Palm Beach. Hope you have a fine 55th Reunion." . . . **Pete Haynes'** comment: "I hope to see you in June." . . . **Ken Blake** states: "May—cannot tell yet." . . . **Javier DeVarona** replies: "Just received your bill for the dues of our Class and I am very sorry to tell you that owing to the present conditions in this island I am unable to send you my contribution." Thanks, J. F. D. It was wonderful to hear from you after so many years.

Many thanks to Arch Morrison, '15; we have received a clipping from him in regard to our very dear friend and classmate **Percy G. Whitman**. P. G. passed away at the Good Samaritan

Hospital, Los Angeles, on May 9, 1967. He received a degree in mining engineering. He served with the Army Engineers in W.W.I. In 1923 he became Sales Manager of the Blue Diamond Company, Los Angeles. He also managed the Rock and Gravel Association of Southern California. In 1936 Percy established the Hunt Process Company, Inc. P. G. was a Past Worshipful Master of the Masonic Lodge in Corinth, N.H. Further, he was a member of the 1913 football squad and a leader in the M.I.T. Musical Club. The Whitmans migrated from England in 1638. Whitman, Mass., was named for his grandfather. The Whitman College in Walla Walla, Wash., as well as several buildings at both Yale University and William and Mary College, were named after the Whitman Family. The Class of 1913 offers its sympathy to his dear wife, Gladys; his daughter, Mrs. Betty Smith; and his son, John Whitman. We all shall miss P. G. . . . We are very much pleased to hear from **John Welch** that he and his charming wife Rose will join us at the 55th. Johnny retired as President of the Standard Dry Kiln Company in 1961 and as a Board Member and Consultant in 1963. Since then the Welch's have travelled extensively to Europe, Florida, the Cape and Martha's Vineyard. Your Secretary converses frequently with Charles Thompson, Bill Brewster, Joe Cohen and Eddie Hurst either by phone or letter. This is the end of this lesson; next chapter in May, also a program of the 55th, probably the latter part of April.—**George Philip Capen**, Secretary and Treasurer, 60 Everett Street, Canton, Mass. 02021.

14

As an outcome of making an up-to-date check on addresses of Fourteeners in preparation for our 1969 Reunion which he and **Harold Wilkins** and **Harold Richmond** are working on, **Les Hamilton** sent us the following Geographical distribution of Fourteeners as of February 1, 1968:

United States		Foreign	
Massachusetts	45	Canada	1
California	18	Brazil	1
New York	17	Mexico	1
Florida	12	Japan	1
Connecticut	12	Germany	1
New Jersey	8	Cuba	1
New Hampshire	6	England	1
Pennsylvania	6	Hong Kong	1
Illinois	5		
Maine	4		
Rhode Island	4		
Washington, D.C.	3		
Ohio	3		
Georgia	2		
Texas	2		
Colorado	2		
Missouri	2		
Virginia	2		
Minnesota	2		
North Carolina	2		
Hawaii	2	Total	174

One each in Vermont, Washington, Maryland, Indiana, Oklahoma, Maryland, Delaware.

For sheer geographical diversity it is hard to beat **Homer Calver's** record. We now have a card from him with the well

known Honolulu Beach, Diamond Head view, and the note: "My friends insist on calling this a vacation when actually I am hard at work (most of the time) as Visiting Lecturer and Consultant at the School of Public Health, University of Hawaii."

Les Hamilton comments: "You well remember that M.I.T. was kind of a local institution in 1910-1914 and now it is spread around. I'd take California three to two over Florida, and why anyone would want to stay in Massachusetts this winter I will never know." We think you are a bit harsh on Massachusetts, Ham. However, if you make that Boston instead of Massachusetts, we might agree. But the problems of Boston don't seem to be entirely climatological—crime evidently plays its part. . . . Our Christmas correspondence included a colored photo of **Charlie Fiske** and Gladie with a Florida background and looking very fit. . . . One new up-to-date address: Philip Covitt, 55 Tumblebrook Drive, Milford, Conn. 06460. . . . We had a good note from **Lin Faunce** which included: "Florence and I spent a couple of days in New York the middle of December to take in the Christmas scene (we lived in that area some 50 years and it still has an allure), and haven't been anywhere since. Yesterday we had planned to go halfway to New York but freezing rain cancelled that out so we are stuck here as maybe you are there. Whatever the situation, we hope it is not bad and is temporary. We did have a little more snow than usual, but our roads are always plowed and the skis are always ready for a little cross country exercise. Come up and see us any time." . . . We think this note from **Hib Busby** contains some very good philosophy to wind up these notes! "The years roll on and still the early friends are the best—only I wish I could see them oftener. So if you ever get down this way please make a point to stop in as Zech did and give us something to remember you by. I have just quit an arduous year's work with one of the 'new' agencies, and had my fill! Am going back to some of my regular consulting work after the holidays (which I have to spend in Texas with the children). Don't know how you find it but a small town that tends to be citified is 'neither fish, fowl nor good red herring.' Genuine rural or crowded city, I believe, suits me best. My best to you always. Bus."—**Herman A. Affel**, Secretary, Rome, Maine. Mail: RFD 2, Oakland, Maine 04963

15

"The Class Supreme" will maintain its name and fame with the Annual New York Class Dinner at The Chemists' Club on April 26, followed by the Boston dinner at the M.I.T. Faculty Club on May 3. Detailed notices will be sent you later. Mark your calendar now, so we'll be seeing you there. **Ben Neal** is coming on up from Lockport for each dinner. . . . **Larry Landers** has joined

the Northern "snow birds" to spend the rest of the winter at Hollywood, Fla.

Donald Hopper passed away on January 10, in Portland, Maine. For many years he was a Technical Supervisor for Bath Iron Works, returning to Portland to join the family furniture firm. The firm closed in 1952. He was a charter member of Portland chapter, Appalachian Mountain Club, and a life member of its Boston chapter. He was past President of the Astronomical Society of Maine, a life member of the Charitable Mechanics Association, a member of the Natural History Society and the Cumberland County Fish and Game Association. The sympathy of our Class goes to his widow and family. . . .

William E. Brown passed away January 4, in South Burlington, Vt. . . . Maybe I should have screamed "Help, help!" a lot louder, because this is all there is for the column this month.—**Azel Mack**, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

16

Headlines: Safari No. 4 in Africa—Our own reporter in Greek crisis—Thirty-one grandchildren—Freighter trip around the world. These are some of the items to be touched on in this month's column. . . . To start off, it is **Herb Mendelson** and **Vi** who have gone off on their fourth safari in Africa. Like some other people we know, they must have been repeating over and over again, that poem of poems, the one we used to know in our younger years that starts: "Let us now be up and going." For when **Herb** and **Vi** go on safari, just as when **Vert Young** and **Sylvia** go on safari, it means big game hunting with stories of excitement and danger and big successes. **Herb** told us on the telephone the night before they went that they had had a "relapse and as a result were heading for Kenya, Tanzania and Ethiopia" on January 19. They were to stop off in Rome for two days and then go on to Nairobi and then Safari No. 4. They had had their shots and were taking Aralene as a malaria preventive. Then: "When we regain our sanity on March 6, our planned return date to the U.S.A., lions permitting, we'll tell you all about our escapades."

In early February we also had notice of other pairs of travelers-to-be over the next few months. **Joel Connolly** and **Virginia** of Tucson were about to start off on something new for them, a round-the-world trip by freighter, and will presumably keep us informed of things international that are of sufficient importance to report in our column. They are travelers of note and lived for several years in Taiwan (Formosa) where **Joel** was an official expert on public health and water problems. They also have dropped bottle messages into the Pacific Ocean and have reported interesting outcomes. . . . Our second pair of travelers, wide-ranging rovers who have supplied us with mini-volumes of

fascinating foreign-travel tidbits, you probably have guessed—none other than **Irv McDaniel** and **Kay** of Newport Beach, Calif. This time they are taking a Matson Line trip to New Zealand and Australia with en route stops that sounds as though it might be the same tour of excitement taken by **Ed Mueser** and **Elsa** in 1963 and by **Steve Brophy** and **Jessie** in 1967. Our readers know of **Irv's** amazing ability to capture in words what they see of the unusual in foreign places and we look forward to new gems from the Pacific, in Polynesia, maybe. He says that as a result of the appearance of his 50th wedding anniversary picture in the October-November issue of the *Review*, he has received many letters, some even with gifts, from old alumni (or their widows) in classes 1912 to 1919. Many of them he had not heard from in years. And the circulation of some of his letters on the Philippines and Singapore (circulated by the class secretaries) have brought him additional mail, for example: "Since my last letter, I have heard from **Henry Sewell**, '07. He was Alumni Member of Tech Show Advisory. I knew him very well, and haven't seen or heard from him for 52 years! My letter in the *Review* is responsible. Marvelous!! Also a letter from **Joel Connolly** who had just read my Singapore letter."

Vertrees Young, in Bogalusa, La., writes that he and **Sylvia** were honored to have a visit on January 2 from **Dina Coleman**, accompanied by his brother and his brother's wife and a Mrs. Fisk, a friend of the family from North Carolina. "Dina had written me that they were coming up the day after the Sugar Bowl game to have a look at the minerals and trophies. They arrived in town for lunch but had to leave by the middle of the afternoon. We thoroughly enjoyed their visit. Dina and I have a very strong interest in common, as we are both trustees of a small liberal arts college. (Dina, Transylvania; Vert, Trinity, Sec.) The price we have to charge for tuition to keep such a college solvent dismays me, but the problem of finding parking space for students' cars crops up perennially, which leads me to think that the price of tuition may not be as exorbitant as it seems. Back in 1914 in Hartford there was not a single car owned by a student! We rode the street car or walked." Then Vert adds: "Hope other classmates will take note that we will be most happy to see them. We are just an hour and a half from New Orleans and will send a car for them if they are traveling by air or train." . . . Writing from Golden, Colo., **George Hale** says the only event that he might report is "the arrival on December 20 of my first grandchild, Jennifer Marie Nowlan, a resident of San Rafael, Calif."

George Maverick in Charlottesville, Va., says that since their Golden Wedding last July, with "summer doings almost too good to be true," Ruth has been scheming and money gathering for the

Albemarle County Historical Society, and he for the Virginia Association for Mental Health. "Both of us find lots to do on Shepherds Hill Farm with my most strenuous work cutting firewood for eight families. Our once lovely peaceful spot is now all noise because 16 acres of our finest trees near the house have been taken and bulldozed for Interstate Route 64. It will go on for two years. A clover leaf starts at our gate so maybe there's profit in our present suffering. The noise and too much snow is tempting us to get away soon for a few weeks in Morelia, Mexico, before we join a tribal gathering of the Mavericks in San Antonio." . . . In January, we had word that **Henry Shepard's** 1913 Chalmers, pictured with our February class notes, had been tucked away for the winter and that Henry was busy shoveling snow and curling. He says he is not sure which of these two activities helped but he bowled a 100 average the night before he wrote, with strings of 97-114-90 which is about the same as he bowled 40 years ago (Boston pins and four-and-one-half inch balls). . . . At the same time, **Francis Stern** in Palm Springs, Calif., sent sympathy for the cold ugly weather in the East, saying: "Just can't believe it can continue day after day. Here it's glorious! Today (January 15) was in the high 70's and yesterday 74 degrees. Played 18 holes of golf."

Willard Brown, now a resident and an extoller of Santa Barbara for nearly a year, tells of some of his doings in recent months. In October, at State College, Pa., he attended the annual meeting of the U.S. National Committee of the C.I.E. (International Committee on Illumination). Here the fall foliage was at its height, something he said one doesn't see in Santa Barbara; "however, there aren't many of Nature's grand spectacles that we don't see out here—well, maybe snowstorms, and those can be had by going up a few thousand feet in the mountains around here." Then at Christmas: "We drove to Phoenix, Ariz., to spend Christmas at the well-known Camelback Inn, some 20 miles north of Phoenix, with Camelback Mountain in between. That darn mountain does look like a camel lying down, two humps and a head. We ran into two couples of retired G.E. lamp executives, life-long friends. One of them lives in Dell Webb's Sun City, some 20 miles northwest of Phoenix. Lovely houses, goodness knows how many golf courses, even a fine restaurant and huge motel. Its population is already 11,000 (yes, I said eleven thousand) which suggests how big this 'retirement' business is getting to be." Willard speaks enthusiastically of a trip to Disneyland, after an absence of ten years: "We saw Disneyland, courtesy of Sam Hamel, a life-long friend who has a large consulting firm in Burbank, and who incidentally was in full charge of the design of all the lighting done by the Fair in New York, including the stupendous 'Fountain of the Planets.'"

Sam, I really think as an avocation, is a sort of chief engineer at Disneyland and seems to have much fun doing it. He was my 'best man' when Dorothy and I were married here last March. By the way if any '16ers happen to be visiting Disneyland, tell them not to miss the Pirates of the Caribbean, by long odds the finest and certainly the most spectacular show; a little gory, maybe." And in Santa Barbara: "We never seem to have less than six kinds of flowers blooming even in winter—just now, poinsettias, roses, bougainvillea, hibiscus, camelias, birds-of-Paradise, and several we don't yet know the names of. And for a month now we have been squeezing our morning orange juice from fresh-picked large navel oranges from our own two dwarf trees; by last count there were still 44 oranges on one of them. And the trees are only about five feet high! What is this word 'snow' that I read about in the papers here?"

Here is a most interesting commentary on last year's happenings in Greece, by our own **Raymond Blakney**, now retired, but formerly (1957-1960) President of Pierce College in Athens and before that, (1950-1957) President of Olivet College, Olivet, Mich.: "Ten months ago, the day before Easter, we left our happy home in Claremont to revisit friends in Greece, especially in Pierce College. We arrived the day before the coup and found Athens quiet and relatively restful, except for the total absence of news of what was supposed to be happening. It was some weeks before our old suspicions were confirmed. The Greeks have always been given to tumult and the ancient Greek version of democracy gets out of hand from time to time. This is what I think had happened. The normal processes of government slowly ground to a halt until the army took over. I saw no sign of unnecessary roughness. The more rambunctious elements were put on an island in the harbor and told to have fun. An American Greek who was over there selling Kleenex told me that when God created mankind, he cursed the Greeks by fixing them so that they could never get along with one another. There could be something in this. In case any of your readers have a Bible, they may be interested to look at a Fourth Century B.C. opinion of the Greeks which St. Paul quoted to his deputy, Titus (Titus 1:12). However, generally speaking, I have always enjoyed the Greeks, and found them often capable of hard work, often extremely intelligent and very friendly, to Americans, at any rate."

It was with some sadness that in January we received copies of newspaper articles about a fire, one in the *Boston Globe* with a picture and caption "Fire Levels Oyster Harbors Landmark" and some with a heading "Oyster Harbors—Ashes, Memories." It was indeed about our Oyster Harbors Club in Osterville, where we held our jubilant 50th Reunion and many

other 5-year reunions. We read: "Today, there is only a black scar and the skeleton-like chimney where once stood the majestic Oyster Harbors clubhouse, former gathering place for movie stars, sports figures, statesmen and some of the world's wealthiest men. Last year directors of the club decided to raze the clubhouse and erect a smaller building in its place. Last week, workmen first stripped the valuable lumber and then put the torch to the remaining wreckage." "Ashes and memories," said **Harry Jenkins**, "that's all there is now." Fond memories for '16ers? They certainly are! . . . Last month we reported the death of **Horace Bickford** on December 18 in a hospital in Bangor, Maine, but we had no details. Horace worked for a number of years in the Machinery Scientific Section of Gibbs and Cox, Inc., of New York City, a company that designed many ships for the government during World War II. In 1951 he left Gibbs and Cox and bought a small machine shop in Jonesport, Maine, for boat repair work. In 1958 he sold the shop and retired. According to the *Bangor News* of December 20: "He was a member of the First Reformed Church of Hawthorne, N.J. He was a 2d Lieutenant in the 5th Provisional Candidates Officers Battalion of the Cavalry, and was a retired professional engineer. He is survived by his wife, Mrs. Beatrice C. Bickford; one son, Horace L. Bickford, Jr., Lebanon, N.J.; one grandson, Peter E. Bickford; and one brother, Reginald S. Bickford, Willow Springs, Mo.; one sister, Mrs. Katharine A. Young of West Dennis, Mass; and several nieces and nephews."

Charlie Reed writes from Washington, D.C.: "**Jessie Brophy** was in Alexandria in November visiting her daughter, whose husband, Col. Tyree, is serving with the army in Vietnam, as is my son, Col. Charles Reed, Jr. Mil invited them over for lunch and enjoyed their company enormously." Charlie keeps busy with a part-time consulting job for McLaughlin Research Corporation, doing technical writing for the Navy on ammunition. Says he: "It is important for us oldsters to have something constructive to do." . . . Last month we mentioned that **Hovey Freeman** of Bristol, R.I., has 23 grandchildren and **Eric Schabacker** of Erie, Pa., has 25. This reminded us that we hadn't checked with **Paul Duff** of Peabody lately to see how he stands in this department. We have now checked and listen to what Paul has to report: "To be grandfatherly boastful, we now have 31 grandchildren!" This we now offer as another intra-M.I.T. first, until such time as someone offers a challenge. But Paul adds: "I'm prouder, however, of the approaching graduation of my baby, 6-foot 4-inch Brendan. He will be the 10th to graduate from college. He will enter the Marine Corps as 2d Lieutenant in May." Ten out of 10 through college! How's that for a record and another intra-M.I.T. first? Paul is ever most encouraging to your

Secretaries and we'd like to include this further comment from him: "Your enthusiasm and push (a term used by me only with the most complimentary connotation) continues to amaze me. Now that I have used the thought of 'enthusiasm' I can't resist a quotation of my mother's: 'Enthusiasm is the genius of sincerity and truth accomplishes no victories without it.'"

Busy is the word that continues to describe **Merrill Pratt**, who is now Chairman of the Continental/Moss-Gordin, Inc., Prattville, Ala., the world's largest manufacturer of cotton ginning machinery, in addition to other diversified products. He writes that he is in his office every morning and spends a lot of afternoons playing golf, weather permitting. Good for you, Merrill, and we hope you'll come and try the delightful 9-hole course at Chatham Bars Inn in June. . . . **Bob Diemer** of Buffalo adds to our class portfolio three more photographs that he took in the Great Court at the June 15, 1916, dedication of the new M.I.T. buildings. As he notes, these pictures show that the ground was covered at that time with light-colored gravel. He is still hunting for his complete set of 10 pictures he took then, one of which showed the hired band, which was called Gallo's Wind Orchestra, at the dedication. He says it seems the older he gets "the more clearly I can recall my days at 'Boston Tech.' I remember you very well, also Ralph Fletcher, Murray Graff, Ping Yok Loo, Allen Giles, Hovey and Jack Freeman and many others. Also the gym at the then-new Y.M.C.A. on Huntington Avenue, the Boston Opera, the New England Conservatory of Music, two eating places on St. Botolph Street, the Copley Plaza, the Boston Library, to mention a few Back Bay scenes." Yes, yes, one of the eating places on St. Botolph Street had luncheon tickets, six lunches for \$1.25, each with two kinds of meat! . . . In mid-January we had word from **Frank Holmes** in Jamaica Plain who wrote: "Being in the poultry business, have been very busy over the Thanksgiving and Christmas rushes. Mrs. Holmes and I are now looking forward to five or six weeks on the Florida West Coast, Treasure Island to be exact. Am still active in business but am getting kind of fed up with government restrictions and taxes. The pleasure of doing business is fast disappearing and I am thinking seriously of turning it all over to the younger generation. I know a lot of people will say it is about time."

We hear regularly from **Spotts McDowell** in Pittsburgh who devotes much time to reading and has just added further titles to his extensive list of books read. For thoughts regarding books that are much worthwhile for today's spare time we suggest seriously that you drop a line to Spotts (4415 Fifth Avenue, Pittsburgh). . . . **Don Webster** points out that with their purchase of a new home in Falmouth (12 Turtle Pond Road), he and Nell will not be going to

Mallorca this winter. . . **Cy Guething** and Gyps reported from Delray Beach, Fla., early in January: "Here we are for the month of January and then we are going where the tides take us. We were at Key Biscayne on New Year's and stayed up until 10:00 p.m., just before it started." . . . And from Anna Maria, Fla., **Will Wyld** writes: "Everything is fine with us here, including wonderful weather all December and much of the New Year to date." . . . From **Coke Flannagan** in Inverness, Fla., we have: "Much to my chagrin I find myself confronted with a question which may also occur to Florida winter visitors still able to cast a sidelong glance at the inhabitants of modern bathing suits and microskirts: Was I born 20 years too soon or 20 years too late?" After an attempt to answer his own question he adds: "I have really scratched my head for some news for you but since I have quit Red Cross and hospital work, there is nothing except trying to make this place of ours look like something."

Nat Warshaw in Hull, Mass., expresses regret at not being able to attend the 51st Reunion last June but says both he and Martha hope to be at Chatham Bars Inn for the 52d this June. . . . As **Ralph Fletcher** reminds us, mark those dates, June 7, 8 and 9, on your calendar for Chatham on good old Cape Cod, and June 10 for Alumni Day in Cambridge. . . . Your Secretary acknowledges friendly birthday greetings not only from '16ers but also from brother secretaries Dix Proctor, '17, presumably as the Proctors rode at anchor on a Dutch freighter somewhere in Oman Harbor, and Azel Mack, '15, just before he and his wife started off on a three-weeks cruise of the Islands and South America. . . . We still have monthly luncheons, joint luncheons of the classes of 1916 and 1917, at the Chemists' Club, 52d East 41st Street in New York, at noon on the Tuesday following the first Monday of the month. **Jim Evans** has continued sending out the notices. Those present on February 6 were Joe Barker, Walt Binger, Harold Dodge, Rudi Gruber and Len Stone for '16, plus Bill Hunter of '17. The next two luncheons come on April 2 and May 7. So if you plan to be in New York, try to make your visit include one of these dates. And in the meantime, keep your Secretaries busy by writing a little but writing often.—**Harold F. Dodge**, Secretary, 96 Briarcliff Road, Mountain Lakes, N.J. 07046; **Leonard Stone**, Assistant Secretary, 34-16 85th Street, Jackson Heights, N.Y. 11372

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It was an interesting luncheon recently when **Al Lunn**, **Jim Flaherty** and **Stan Dunning** met with **Nelson Chase** to view and learn more of the six large, painted tapestries which he did that hang in the Great Hall dining room of the Boston Harvard Club. The acous-

tics of the hall needed improvement and these tapestries were the answer. Nelson was commissioned to design and paint these views of prominent Harvard buildings. They are true reproductions and very interesting as well as excellently executed. Painted on heavy burlap and hung over acoustical material the sound effect was a big improvement. This was in 1958. In 1963 he painted large murals of the Harvard Medical School and the original Harvard buildings in the room adjoining the Massachusetts Room of the Club. . . . The **Ray Stevens** went to Naples, Fla., in October this year but came back north for the holidays. . . . The **Bob Erbs** returned from Florida but have gone back. . . . **Conchita** and **Harry Pearson** left Toronto in December for Mexico City where they are passing the winter.

Jimmy Doon on retiring as Secretary of the New Hampshire Public Utilities Commission was tendered an elaborate testimonial party at Concord's Highway Motel on February 1 to praise him for an illustrious career as soldier, active American Legion national officer, engineer, manufacturer, justice of his home town court, educator and best of all father of six children, all of whom were given the privilege of a college education. Three hundred and fifty friends and admirers attended the party in his honor. We all recall Jim's prowess as a runner while at M.I.T. He became captain of the track team in 1917 and also was President of the M.I.T. Athletic Association. Retracing Jim's experience following graduation one finds many things of interest. First, like most 1917ers, he went right into World War I military service. He joined up with the famous 303d Field Artillery of the 76th Division as a Lieutenant. In World War II he was decorated several times and attained the rank of Colonel. In his army experience he made many influential friends who were undoubtedly his loyal boosters when, subsequently, he was selected to go beyond his local American Legion Post to be elected New Hampshire State Committeeman and that was followed by his election to be a Vice Chairman of the National American Legion organization.

Jim's wife Helen had been a school teacher and a democratic representative from their predominantly republican home town of Henniker (16 miles west from the state capital at Concord). Originally Jim's venture as a manufacturer of bicycle rims ran into the handicap of the great depression. Although he tried to revive this business through the early use of plastics as his principal material, nevertheless, with the rise in costs and decline in demand he liquidated this venture and moved on to other fields. Not only did Jim serve as Town Justice in Henniker for a long period but he must hold some sort of a record for being Town Meeting Moderator for over 30 years. This is a very significant tribute to him.

With his engineering training, Jim sought and gained employment in Concord, N.H., with the Public Utilities Commission where he served as an engineer. Later he moved up to the position of Secretary of the Commission and performed his duty with distinction through several state governmental changes regardless of politics.

Besides all this, Jimmy was one of the five prime movers and founders of New England College in Henniker, N.H., in 1946. It is privately endowed, has a coeducational student body of 850 and a teaching staff of 60 or more. In November, 1967, he saw his college receive full accreditation for its high standards and excellent faculty. He has been on the Board of Trustees continuously since its founding and served as its Chairman in 1950. The College not only granted him an honorary L.L.D. degree but named one of its dining halls for him. Jim has purchased a lovely Cape Cod cottage into which he has, or will soon, move. He is hanging up his shingle which reads "Attorney" and will probably find himself busier than ever. All in all, our Jimmy Doon, the M.I.T. track star, has managed to make good use of the 50 years since his graduation. He has done alone what normally requires two or three people to accomplish; yet he lives happily with a lovely wife and family in a community and state on which he has left a mark long to be remembered. The Class of 1917 salutes Jimmy Doon. . . . Our roving reporter on various occasions has liked the appearance of cardinal-blazered classmates Ray Stevens, Tom Meloy, Al Moody, Dick Lyons, Les Ford and Brick Dunham; also Ken Lane as he appeared at the "Annual Florida Festival" at Orlando in January.—**C. Dix Proctor**, Secretary, Box 336, Lincoln Park, N.J. 07035; **Stanley C. Dunning**, Assistant Secretary, 6 Jason Street, Arlington, Mass. 02174

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50th Reunion; Wianno Club, Osterville; June 7-10, 1968; for reservations: John W. Kilduff, P.O. Box 33, Amesbury, Mass.

The years when we approach the far horizon are usually those when we have the most serene and gracious minds. The nerves of youth no longer sing with excitement and, if a life has been well lived, there are strong and deep-rooted impulses to make the most of old friendships before the sunset fades. Thus comes a cheering note from **Jim Flint** (262 Ashbourne Place, Columbus, Ohio 43209). "In the January class notes I was delighted to read about your surprises. I am certain both were well earned. I have been considering attending the 50th Class Reunion as a result of pleasant urgings. If you know the detailed schedule as planned would you drop me a note? Georgia has made a fine comeback from a serious heart attack a couple of years ago and I am

fine. I hope you are in your usual excellent spirits and health." . . . The mystery of **Stuart Caldwell's** whereabouts, following his disappearance from Detroit, has been solved. He is currently keeping out of deep water on dry land by watching, from 31 King Street, Rockport, Mass. 01966, the wild, wet fury of the Atlantic on its winter rampages. We hope he will be at the Wianno Club, Osterville, early on Friday, June 7, to help pipe the arriving classmates aboard in proper seagoing style. There's something special about a 50th Class Reunion.

Again, with the music of enduring college ties, **Julian Avery** (Clapboard Ridge Road, Greenwich, Conn.), encloses in his letter to me a copy of one to **Johnny Kilduff**. Taking these in order, he says: "I smashed my right wrist some years ago and, although it is strong enough to wield axe and sledgehammer, it doesn't write very well!" Well enough to delight me, Julian. "I retired as a full time employee of Ethyl Corporation (Technical Advisor) in 1961, and since then have operated as a consultant to various companies, mostly Standard Oil Company (N.J.), Esso Chemical Company, Ethyl Corporation and M.W. Kellogg Company. In this capacity I am as busy as I choose to be, which is very busy. We do quite a bit of theater-going, usually matinees because I can now take an afternoon off when I choose. I spend most of my spare time gardening, which I find rewarding. It keeps me in fine shape physically, and it is great to have beautiful grounds to look at. I have just retired (as of March) as a director of Chemical Fund after 21 years, and am about to retire as a trustee of Rosemary Hall (a girls' school in Greenwich from which all four of our daughters graduated) after six years as Treasurer, three years as President and three years as a member of the Executive Committee. Industry has its problems, but so does a girls' school! Our four daughters are now all married and we have nine grandchildren. Yesterday I mailed a letter to **Rolf Knudsen** and Ingeborg in Norway, and closed by urging them to come to the 50th. I hope they will come. The Class once held a reunion at the Cliff House in North Scituate. That was 1928. We still have our family cottage at Scituate, and if the reunion site is near enough I will promise everybody a fine clam-bake. That is my news and I look forward to seeing my old friends next June."

Now for his letter to Johnny. "I look forward eagerly to our 50th Reunion and hope shortly to receive details about the arrangements. Meanwhile, I want to discuss the 50th Year Class Gift to M.I.T. Years ago, I made over to M.I.T. an interest in royalties from an invention of mine which was promoted commercially by A.D. Little when that organization was half owned by M.I.T. For a few years these royalties went into the general fund, but then I made

a deal with Jim Killian, '26, to set up the Julian M. Avery Scholarship Fund to support two scholarships in the Department of Metallurgy under Professor John Chipman, who then headed the Department. I do not recall just when it happened, but the Fund was finally set up for \$50,000 in my name. It was eventually well over that, so I feel I have done my bit for M.I.T. Thus, I have been listed as a 'Benefactor of M.I.T.' and I suppose the scholarship will continue indefinitely. The question now is whether there is some way for the Class to have credit for this as part of the 50th Year Class Gift? (It seems to the Class Secretary that the same should be true of the scholarship **Ernest Grunfeld** set up for the Architecture Department.) You may be curious as to what these royalties were. I invented the process known as 'High Top Pressure Operation of Pig Iron Blast Furnaces' which turned out to be a great success commercially—it has been reported that over 80 per cent of the pig iron produced in the U.S.A. is produced under High Top Pressure Operation. But, unhappily, my patent expired before the steel industry adopted the process in a big way, so A.D. Little, M.I.T. and I got out of it only a small fraction of what we had expected. However, I did receive the Franklin Institute's Clamer Medal for it in 1958, and A.D. Little has received numerous awards and honors from technical societies and the Iron and Steel Industry."

Writing from 2823 Arlington Street, Sarasota, Fla. 33580, **Charlie Dow** says: "We set out from Massachusetts on December 27, apparently just before your extended period of winter set in. Life here has very few minutes of complete inactivity, but none of these activities would make interesting reading. However, if you don't come up with decidedly improved weather, I shall stay here until about May 1. By then Jaffrey should be plowed out." What do you mean plowed out? We sometimes even shovel out, and my driveway is 400 feet long. . . . With a deep rooted impulse, going back for half a century, **Leonard Levine** (519 Washington Street, Brookline 02146) says: "When you noted in the *Review* that **Walter Engelbrecht** was living in Oklahoma, I wrote him. We were very close friends in school and played on the ball team together. I received back a letter from his wife informing me that she was ill and that Walter had passed on, as you had subsequently reported. I am still teaching Drafting and Design at North East Institute. There is satisfaction in seeing young men spend 45 weeks in an intensified course, and then go out to get drafting and technical jobs for \$125 a week with good companies. Without this training many of these fellows would have a hard time getting any job. I presume you have received the attached information but I send it anyway. I read your report about Tom and John visiting you last summer and realize

why you were so fond of Tom. I had a very pleasant chat with Tom and his wife last June." "The enclosed," was a newspaper clipping of **Tom Kelly's** death (144 Lawrence Street, Gardner, Mass. 01440) on Sunday, January 7. He left his wife, Madeline, two daughters, two sons and an unnamed number of grandchildren. He served in the Chemical Warfare Division of the Army during World War I. For most of his life he was President and Treasurer of Lilly Chemical Products, Inc., of Gardner. He was a member of the Newcomen Society, the Oak Hill Country Club, the National Association of Manufacturers, the A.I.M. and the New England Council. Such were the dull statistics in the paper. Tom, the gentleman of serene and gracious mind, was far more than this. He built strong and deep roots into his family life. He was a whole union of talents. I remember once, decades ago, I was explaining to an audience that the surest way to be understood, (and understanding is the right word, not communication), is first to repeat back to the other person what he has said, only say it better than he did. Then he will listen to what you want to tell him because he knows you have listened to him. Afterward, Tom said, "Alexander, I've done that over and over and over so many times in my business." To know Tom was to know he did it gently too. The healing and the hope that he gave to other people is not over. Within the week, as I write this in February, there has been a fisherman on the pond across which my front windows face the far horizon. Just by way of one human being to another, I asked what luck he had. "Three fine bass." So we fell into conversation. When he told me he was from Gardner, I asked whether he knew Tom Kelly. "Know him? I worked for him. Do you know what? I believe if he heard of a better job for me, even if it would hurt his business if I left, he'd have told me about it." Time holds us all in the net of its relentlessly unwinding thread. Now Tom has reached the far horizon, which no man reaches more than once. He lived with dignity, died with courage and is remembered with affection, even as one of his employees touched me by mere chance. It is not true that the grave levels all men.

Ernest Bridgwater (25508 Adobe Lane, Los Altos Hills, Calif. 94022) shares similar news from the West Coast. "I don't know when I've given you an item for the class notes. But I have an incentive for writing now, although not a happy one. Have you heard that **Leslie Thorpe** died December 17? He had been ill for some time and was taken to the hospital in Carmel on December 7. He seemed to be improving quite rapidly but on December 17 a sudden coronary took him. I get this information from his widow, Betty. I think she will continue to live in the retirement home they moved into a couple of years ago. It's Sunset House, P. O. Box 1925, Carmel. **Earle Stewart** died on January 1. Mrs. Stewart didn't give me any details. I have never met

him either, but had written to him concerning the Alumni Fund. In fact, I hadn't talked to him because they had moved from their former home and had no phone. As for myself, we've been living in Los Altos Hills since I retired from Du Pont seven years ago. I'm quite well, do a lot of travelling and putter around in the garden. Both of our children and six grandchildren live in California, one family near here and one in the Central Valley, very close to the Sierras. This is a beautiful sunny day, with a slightly chilly breeze. Wish you were here to enjoy it with me. I'm looking forward to Reunion in June and will, of course, see you there."

Courtesy of G. Edwin Hadley, '38, of 19 Beech Terrace, Milburn, N.J., comes the following: "**Ben Merrick** died on December 31 after a short illness, leaving a wife and son, Bentley, Jr. I did not see the obituary, so am proceeding from the memory of 30-years association. He was 72 and had retired from his position as a department head for the Bell Telephone Laboratories after 37 years service. He either left the Institute or was graduated early to become a pilot in the A.E.F. After leaving the service he joined the Western Electric Engineering Department which became part of the new Bell Laboratories in 1925. The first 30 years of his career were spent in tool and hardware development for use on telephones outside the plant. He then turned to oceanographic work which the Laboratory was conducting for the Navy. It was my good fortune to be associated with him in both areas, as well as becoming personally involved as a sort of foster nephew. He never hesitated to say what he thought, often being frank to the point of brutality, but through the exterior shell his love and consideration for his associates, and above all for his family, always shone through." . . . The Alumni Office closes this list of classmates for whom the sunset has faded by sending information that **Sidney J. Judson**, 8424 109th Street, Richmond Hill, N.Y. 11418, died on June 13, 1967. **Willard E. Imhoff**, 3411 5th Street, Port Arthur, Texas 77640, followed on November 6. No further details were made available. See you at Reunion!—**F. Alexander Magoun**, Secretary, Jaffrey, N.H. 03452

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Your Secretary attended the M.I.T. Florida Fiesta at the Statler Hilton Hotel in Orlando on Saturday, January 27. There were talks by department heads, Dr. Keil, Mr. Wadleigh, and by Dr. Killian. Also present from our class was **George Irwin**. On Sunday the conference sponsored a 2½-hour trip through Cape Kennedy which was most interesting. Over 200 attended the Fiesta. Next year should see more '19 men attending, if they make it an annual event. . . . A dinner meeting of the Class of 1919 was held on January 16 at the Faculty Club in Boston. Those present at the dinner were: Dean K. Webster, Paul D. Sheeline, Arthur C. Kenison, George Michelson,

Ed D. Moody, Arklay S. Richards, Royden L. Burbank, Morris E. Goodridge, W. O. Langille, and D. D. Way. **Paul Sheeline** reported on how our 50th Year Gift is progressing and explained various types of bequests which could be made to add to it. **Will Langille** outlined his plans for our 50th Reunion which will be held on campus and at Chatham Bars Inn. In the near future, you will all be receiving publicity concerning plans for the Reunion. . . . **Aubrey Ames** writes from San Francisco that, due to the fact that he was out of the country for a long time, he has not attended many reunions, but plans to be at the 50th. . . . **Roy Burbank** is Regional Chairman for the Alumni Fund Drive for Andover, Mass. He lives in Belmont and says that he is practically retired. . . . **Ed Moody** wrote from Hollis, N.H. He still writes poetry and plans to be at the 50th.

Marshall Balfour wrote in to say he is hoping to be around for the 50th. He lives in South Kent, Conn. . . . **Harold F. Marshall** wrote to Dean Webster. His only continuing contact with M.I.T. is his old roommate, **Charley Chayne**. Harold lives in Palmyra, N.J. . . . **Dean Webster** will be in Arizona and California in February and March. . . . **H. D. White**, who retired in 1958, is now living in Vandalia, Ill., with his second wife, whose family has owned the farm, which is their home, for 100 years. Since his retirement, he makes a trip to New England, where his sisters and brother live, every year. Last summer he and his wife took a trip on a Canadian National service ship from St. Johns up the Labrador coast. His son is in the construction business at Oakbrook Del E. Webb Company. His daughter, a Ph.D. in biology from the University of Wisconsin, is in research at the Children's Hospital in Cincinnati. Her husband is with the Cincinnati Milling Machine Company in plastics research. They have four children.—**Eugene R. Smoley**, Secretary, 30 School Lane, Scarsdale, N.Y. 10583

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As this column has often testified, our distinguished Class numbers a legion of venturesome and enthusiastic travelers to whom must now be added the following trio. . . . Take **Stan Reynolds**—after mentioning his visits to Keltic Lodge on Cape Breton, N.S. (and agreeing with me that the seven-mile golf course there is one of the world's sportiest and most scenic), Stan says that the picturesque courses at Digby and at Green Gables on Prince Edward Island are also worthy of our classmates' golfing talents. Stan and Dottie, whose home is at 425 East 86th Street, New York City, drove across the continent, stopping at Denver, Colorado Springs, Mesa Verde, Monument Valley, Grand Canyon, Bryce and Zion, Las Vegas, Sequoia and Yosemite, San Francisco, Crater Lake, The Dalles, Portland, Seattle, Victoria, Vancouver, Glacier Park, Lake Louise, Bauff, Jasper, Waterton, Yellowstone Park and the Grand Tetons, the Black Hills and Bad-

lands of South Dakota, Minneapolis, Wisconsin Dells, Chicago, and back home. How about that one, fellow wanderers? Stan avers that their 10 days in and around San Francisco represented the highlight of the entire trip and, of course, that gets no argument from me except that, like Amy and me, they should stay out there longer. We were there part of February and all of March. However, not content with this safari, the Reynolds later proceeded by plane to London and took a grand tour by auto of England, Scotland and Ireland. They took over 1,000 pictures and if they don't bring some of them to the 50th Reunion the rest of us travelers will certainly be disappointed. Stan complains that they didn't get to Expo or to Hawaii. Better leave something for this year and next, Stan.

Dorothea Brownell Rathbone blames her wanderlust in part on the reports in this column to the effect that "everyone retired seemed to be whirling around." At any rate, she flew around the world in 30 days and had a lovely time collecting impressions of Asia, all kinds of people, and the varieties of vegetation "of much interest to a pseudo landscape architect." Dorothea says she was happy to get back to good old New England where climbing over rocks got her a head start on the Acropolis and where our 129 kinds of weather enabled her to take all kinds in stride. What a grand gall! . . . Finally, there is **Dan Lord** and his wife Vivian who celebrated their 45th wedding anniversary with a trip to Paris, Amsterdam and London. They didn't miss a trick—the Louvre, Napoleon's Tomb, Sacre Coeur, Montmartre, Moulin Rouge, Folies Bergere, The Lido—the Rijksmuseum, cheese farms, diamond cutters, Island of Marken—the Tower of London, Buckingham Palace, British Museum, Warwick Castle, Windsor Castle, Hampton Court and Stratford-on-Avon. Dan, with homes in Marblehead, Mass., and Salem, N.H., has two sons and seven grandchildren.

Dusty Miller of Phoenix, Ariz., writes that he "retired again to become Assistant Travel Director of the Arizona Automobile Association. Dusty is no slouch when it comes to personal travel, having toured South America last year and taken a trip to the South Seas before that. . . . **Bill Dewey** writes to say that he is enjoying retirement. Bill and Barbara spend their summers in Ashfield, Mass., and divide the rest of their time between their home in Longmeadow, St. Petersburg, and visits to their three children and seven grandchildren. He says: "See you on Alumni Day in June." That's a date, Bill. . . . A note from Frances Moss crop says: "Scoop was a wonderful person to have lived with for 43 years." We too treasure the memory of the grand guy and beloved classmate. . . . By this time you will have already heard from our new 50th Reunion Class Gift Fund Chairman, **Lee Thomas**, so it suffices to say that the recent meeting of the Steering Committee that welcomed Lee to the Chairmanship was one

of considerable significance and of guarded but well founded optimism. On hand to greet Lee and pledge heartfelt encouragement and support were Prexy **Norrie Abbott**, Class Agents **Al Burke** and **Perk Bugbee** and the ever-present Class Secretary-Treasurer, **Bob Patterson** had planned to be there but was prevented by a conflicting engagement, not, we are happy to say, because of ill health which he has been combating valiantly. Reunion Chairman **Edwin Ryer** and Estate Secretary **Pierre Lavedan** were at a distance escaping the rigors of New England winter, but we can assure you they are very much on the ball. . . . Now is the time for all good '20 men to come to the aid of their Class. We are confident we can count on you.—**Harold Bugbee**, 21 Everell Road, Winchester, Mass. 01890

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Income tax chores completed? Then turn to something pleasurable, such as making reservations right now for you and your wife to spend Alumni Day '68 in Cambridge with your best friends on earth—that sturdy group of the Class of '21 which never fails to be on hand. The date is Monday, June 10; if you haven't received an application form, address a request to the Alumni Association. If you need hotel accommodations, you'll find an increasing number of our Class based at the Charter House Hotel down Memorial Drive in Cambridge. . . . The first M.I.T. Florida Festival, held last January 27 in Orlando, is now glowing history in Technology annals and we are most appreciative of the efforts of **Phil Payson** and **Pete Hand**, '48, in being able to bring you this account of the participation of the Class of '21 in the initial gathering. It all started with a welcome note from Phil from his home at 5031 Northampton Drive, Tanglewood, Ft. Myers, Fla. 33901, saying: "Marion and I expect to be at the M.I.T. Florida Festival. **Paul L. Hanson** had a stroke a few months ago but is coming along. His present address is 250 Point Lodos, San Francisco, Calif. 94121." Pete Hand sent a delightful invitation to attend and, indeed, both **Helen** and **Ray St. Laurent** and **Maxine** and your Secretary considered being present.

Now, we have another letter from Phil on his return home: "Thank you for your letter. We are sorry that Maxine and you could not be at the Florida Festival on January 27, which was Marion's birthday. You were missed. On the morning of the 26th, Orlando was down to 32° but on Sunday, it was in the 70's. They say this occasionally cold weather makes citrus fruit taste sweeter. Marion and I drove from Ft. Myers, arrived at Orlando Friday afternoon and checked in at the Statler Hilton Inn, a 250-room motel with an enclosed patio containing a heated swimming pool in a setting of beautiful tropical plants and trees. This was the scene of the day-long celebration, with various presentations, entertainment and a top-notch banquet. Most alumni and

wives arrived in several busses chartered by alumni clubs in various Florida areas. Peter C. Hand, '48, General Chairman of the Festival, showed me the letter you wrote him and we promptly rounded up the group of four men from the Class of '21 and their wives. In addition to Marion and me (Course II), there were: Kathryn and **Edwin F. Delany** (Course I), who were vacationing in Florida after Ed's recent retirement. Their home is still 8 Welgate Circle, Wollaston, Mass. 02170. Martha and Col. **William C. Ready**, U.S.A., ret. (Course I), were there from their home at 1904 Flora Road, Clearwater, Fla. 33515, and **Ola** and **Henry C. Taintor** (Course II), of 88 Harvard Drive, Ormond Beach, Fla. 32074. The eight of us sat together for the interesting program and had a group picture taken, which I'll send you as soon as received. Kay and Ed Delany took the bus trip to Cape Kennedy and the rest of us drove home on Sunday morning. There was a note on the bulletin board that **Miles Zoller** was unable to make the trip but sent his regards. During the program, the many changes around Cambridge and Boston were shown and detailed explanations given on the quality of recent freshmen and advancements in M.I.T. courses. Chairman of the Corporation **James R. Killian, Jr.**, '26, gave a most interesting talk at the banquet. It surely made us feel proud to be connected with such a fine institution. The Festival is expected to be an annual affair and our group hopes to see each other soon. Thank you for writing to Paul Hanson." Phil included a picture of the motel's spacious glassed-in court and pool, amid a setting of profuse vegetation, dotted with outdoor tables and lounges. He also enclosed the complete program, variously inscribed by the '21 gang: "Hi, Ray—Hi, you Clarks—miss you—wish you were here—having a wonderful time!" It was signed by Kay ("What, no large hat?") and Ed Delany, Marion and Phil Payson, Marty and Bill Ready and **Ola** and **Hank Taintor**. Our thanks to all for their good wishes and much-appreciated help in supplying needed news for these columns. We commend Phil's reporting ability and meticulous care in obtaining full details. Wish all our readers were as thoughtful in supplying news and as accurate in its contents. In thanking Pete Hand, it should be noted that a considerable number of our '21 classmates have retired to permanent homes in Florida and this gregarious Class of '21 might just decide to have an interim reunion down there at some future festival if some of those '21 Floridians would stir up the rest of us to make the pilgrimage *en masse*! . . . Marty and Bill Ready have sent us a note in which Bill says: "Sorry to have missed our reunion in Mexico. I had a bad year, first diabetes and then bronchial pneumonia. Just getting back on my feet."

Elliott B. Roberts, retired Captain of the Coast and Geodetic Survey, affectionately known as "Mr. Coast and Geodetic Survey" for his outstanding hydrographic contributions which earned him the

Meritorious Service Medal, wins our perpetual gratitude for heeding continuous appeals and volunteering his news. Says Elliott: "Another of my infrequent communications. But I haven't had much to tell you since my retirement five years ago from the Coast and Geodetic Survey—then a primary organizational unit of the Department of Commerce and now a component of E.S.S.A., the Department's Environmental Science Services Administration. For some years I have edited *Explorers Journal*, published by the Explorers Club of New York. I had my third book on science interpretation for juveniles published last year, *Volcanoes and Earthquakes*, published by Pyramid, New York, at \$.75. A couple of other books are stirring around awaiting the right opportunity to get published. I am currently on the Board of the Retired Officers Association, for which I also serve on the Publications Committee. I am Chairman of the Program Committee of the Cosmos Club, Washington, where we stage a serious informative lecture each Monday evening from October to May. These cover the waterfront as to subject matter, with little emphasis on travelog material, which is pretty well taken care of hereabouts by the National Geographic Society. My wife, Becky, serves, and we help support, the National Symphony Orchestra and we have some interest in divers other social service activities. We have had opportunities since retirement to travel, visiting, in two trips to Europe, several of the places we learned to like during my official traveling days. Our grandson, **Danny Cross**, 13, of Cedar Rapids, Iowa, opines that he may attend M.I.T. in due time. I doubt that there are many who will find interest in the foregoing except perhaps **Dick Smith**, retired Manager of the Natural Resources Department of the Chamber of Commerce of the U.S., and **Julian Berla**, '23, both local friends, but you do continually ask for news of us." A consultant in geodesy and geophysics, Elliott is active in the American Society of Civil Engineers, the American Geophysical Union, the American Association for the Advancement of Science, Seismological Society of America, Philosophical Society of Washington, Washington Academy of Sciences, Society of American Military Engineers and the Authors League of America. He enjoys landscape painting as a hobby. He and Becky have a married daughter, **Nancy**, and two grandchildren. The Roberts live at 4500 Wetherill Road, Washington, D.C. 20016.

Albert S. Genaske also rates our everlasting thanks as another staunch friend who took the time to supply news in response to our repeated pleas for help. In a letter to Ted Steffian, Al says: "After being out of M.I.T. for 47 years, it seems strange to be writing my second letter within about three months to my Class Secretary. After being a widower since April, 1966, I married, this past New Year's Eve, **Theona Sargent of Fryeburg, Maine**, a widow and a childhood friend since 1914. We will be living in Fryeburg and I would appreciate it if

you would give my new address—138 Main Street, Fryeburg, Maine 04037—to the powers-that-be, so that my copies of the *Review* will go to the new address. Now, my home will be only 12 miles from our summer cottage on Lake Kezar in Lovell, Maine. After a trip to Florida, starting in mid-February, and another to Hawaii, starting in the latter part of March, we will settle down in the North Country for good." Al formerly lived in Newton Highlands, Mass. We printed his previous letter in the Oct./Nov. issue of the *Review* and gave some details of his retirement last year, after 40 years with the Metropolitan District Commission of the Commonwealth of Massachusetts, in Boston. We all offer sincere congratulations and best wishes to Theona and Al and hope they will attend Alumni Day '68 on campus in Cambridge next June 10 so we can officially welcome them into our friendly circle. We hope they'll also consider leaving Maine occasionally to join our '21 group for an interim reunion in, say, Mexico in 1969 or Florida in 1970, in preparation for our fabulous 50th Reunion in 1971. Did you see **Harry Field** in Hawaii, Al? And what '21 people did you see in Florida?

O. Kenneth Bates earns his share of our thanks for sending us a follow-up note on our paragraph about him in the January *Review*. Ken says: "I retired last June as Cummings Professor of Mathematics Emeritus after 46 years of college teaching—12 years in the Physics Department at M.I.T. and the next 34 years at St. Lawrence University, Canton, N.Y. Have three daughters and one son, graduates of Wellesley, Columbia, Cornell and St. Lawrence. Also a total of eleven grandchildren, comprising six boys and five girls. Greatly enjoying retirement. Have kept in very close contact with many of my friends from M.I.T." You omitted giving us your home address, Ken; what is it? Wish you'd return that personal data form. Now that you have no school chores in June, won't you join the Class of '21 at Alumni Day and also plan to attend our 50th Reunion? . . . The parade of our helpful news benefactors continues with a note from **Thomas W. Proctor**, Box 37, RFD 1, Darlington, Md. 21034. Tom reports: "I worked for Van Rensselaer P. Saxe, Baltimore consulting engineer, on a hospital job last year. Since then, I have been devoting my time to my farm here, where I have some cattle and sheep." Tom retired in 1962 as Senior Engineer in the Structural Test Department of Martin-Marietta Corporation, Baltimore. He and Constance have a married son and three grandchildren.

Assistant Class Secretary **Edwin T. Steffian** writes, in part: "I have been intending . . . This is not the way to begin a letter but, in fact, I was going to write about my own family when your letter came with a sample of the 50th Reunion stationery being promoted by **George Chutter**. I think it is fine. My news is that I have a son, John Ames Steffian, who is teaching Urban Design at M.I.T. As you know, he was in my architectural office for a while, after working five years in the

Philadelphia area, following graduation from the University of Pennsylvania in architecture in 1957. In the fall of 1966, he entered Harvard, received his master's degree in urban design in 1967 and promptly received an academic appointment at the Institute. He has a son, John Ames, Jr., and a daughter, Emily, and makes his home in Boston on the Hill. My son Peter, also a Pennsylvania graduate in architecture, is a member of my firm. He is married, has two little girls, Amy and Hanna, and lives next door to me in Cambridge. Lovina and I are planning a trip to the West Coast this June. We will attend the American Institute of Architects convention in Portland, Ore., will visit in California and may return via Texas. Will give you details later." Ted has maintained his own architectural and planning practice since 1932. Edwin T. Steffian and Associates, Inc., 19 Temple Place, Boston, Mass. 02111, is well known for its many successful building designs and its numerous citations for bold, forward strides in the application of modern methods and materials. But Ted didn't tell us of the fame achieved by Mrs. Peter Steffian with Lovina's frozen strawberry mousse recipe, named a winner by the Boston *Sunday Herald*. Enclosed in a letter to your Secretary from Class Prexy **Ray St. Laurent** is a note from Helen to Maxine, with the clipping and the recipe. The clipping has a picture of Beth and little Amy obviously enjoying the delectable dessert. Maxine has vigorously opposed our including any recipe, even this superb treat, in Class News, but we'll offer to send a copy to your wife, dear reader, if she will give us news of your family's activities and tell us you're planning to attend our 50th Reunion and considering joining the '21 group at some earlier gathering.

Ray St. Laurent says a note from Ruth and **Irv D. Jakobson** reports having an "exciting and delightful holiday," marked by "wonderful visits with Marge and **Jackson W. Kendall** at the New Year's Day festivities in Pasadena, Calif. The Jakobsons also saw Catherine and Harry Field in Hawaii. Ray says he was unable to reach **Elmer W. Campbell** on a recent trip to Lovell, Maine. . . . A note from the **Harry P. Field** couple in our Island Paradise State says: "We are happily settled in our new apartment and enjoying our new way of life in this beautiful retirement residence." They sent alohas and best wishes to all from Arcadia Apt. 1137, 1434 Punahou Street, Honolulu, Hawaii 96822. . . . Ednah Blanchard says: "I do enjoy reading your notes in *Technology Review*. They keep me 'au courant' on the activities of 'my boys.'" . . . Ruth and **Ralph Wetsten**'s remarks, penned by Ralph, read: "I can't refrain from repeating how much I appreciate your excellent reporting in the *Review*. Wish I had some items of interest for you to include. Our activities have been limited this past year. I found it necessary last spring to have an operation for the removal of a cataract from one eye and then a second operation in the

fall on the other eye. It is wonderful to be able to see to read and write again—and, of course, to view the miniskirts! I am now being treated for diabetes, which keeps me on a sugarless diet and seems to have weakened my foot and ankle muscles, making it difficult to get around. I hope to gain strength to walk normally as time goes on. We hope you are enjoying your habitat on the New Jersey shore." The Wetstens left our Garden State some while back to live near Lincoln Center in an apartment at 155 West 68 Street, New York, N.Y. 10023. . . . Maxine and your Secretary are happy to report the arrival of Sallie Berry Clarke on January 25, 1968, to our Alfred and Marie in Glen Ridge, N.J. Sallie has a sister, Margee, who is two years old. Molly Ann Blanton, daughter of our Ellie and Joe out in Grand Rapids, Mich., is celebrating a birthday as we write these notes.

Joe Wenick, Alex and **Munnie Hawes**, Maxine and your Secretary attended the excellent dinner meeting of the M.I.T. Club of Northern New Jersey, complete with tour, demonstrations and satellite communications lecture, at the huge new Bell Laboratories complex in Holmdel, N.J. We drove our Brielle neighbor, Ed Aldrin, '17, and the Hawes couple to the affair and had expected to meet Betty and **Sumner Hayward** there. Most regretfully, Betty phoned two days before the meeting to say that Sumner was in the hospital with fever and other considerable discomfort. She also reported they had recently entertained Helen and **Robert F. Miller**'s son, Bob, Jr., and his wife and two little sons at the Hayward home, 224 Richards Road, Ridgewood, N.J. 07450. Subsequently, Sumner underwent surgery for a fourth time in recent years—again a kidney stone. We have kept in touch with Betty and phoned Sumner in the hospital on this early-February morning. He is recovering quickly and we hope he is back at his lengthy walks in Harriman State Park with his neighbor, Malcolm B. Lees, '20, as you read these words. Write to Sumner. . . **Arthur L. Silver** has revised his address from the business address he used as an insurance consultant to his home, Beaver Hill Apt. A21, Jenkintown, Pa. 19046. This suggests you may have retired, Art, to indulge that fishing hobby despite your last note, which answered our query with "Retired?—Never!" Ruth and Art have a married daughter, Patricia, and two grandchildren.

Samuel E. Lunden, one of our famous group of West Coast architects, says his firm of architects and planners, Lunden and Johnson, has taken up new quarters in Suite 910, 453 South Spring Street, Los Angeles, Calif. 90013. Sam is a Fellow of the American Institute of Architects, an Honorary Secretary of M.I.T. and a lifetime member of the Board of Governors of the M.I.T. Club of Southern California. . . . **Dugald C. Jackson, Jr.**, has revised

his mail address to read: Tetrastemma, Harmony Hills, R.F.D. No. 2, Harve de Grace, Md. 21078. . . . **Ernest R. Gordon** reports removing his home from El Paso, Texas, to 143 Buena Vista Drive, Grand Junction, Colo. 81501. A former manager of mining operations for the properties of mining companies in the Americas and overseas, he retired in 1964 as a consultant on mineral depletion and mining taxation for the U.S. Internal Revenue Service. Aurora and Ernie have two sons and a daughter, all married, and seven grandchildren. . . . **C. Levon Eksergian**, former consultant for Kelsey Hayes Company, Romulus, Mich., says his new address is Sugar Trees Farm, R.D.1, Stillwater, Pa. 17878. Wish Levon would confirm that this move indicates retirement, as we assume. The winner of the Henderson Medal of the Franklin Institute, Levon had for many years been associated with the Budd Company, Philadelphia, as Head of the Metallurgical Laboratory, Chief Engineer and Executive Engineer in charge of Production and Research for all company products, ranging from farm implements to railroad and R.D.C. cars and automobile bodies, wheels and brakes. He is a member of numerous engineering societies, industrial associations and social organizations and has held many offices and committee chairmanships. He has published several technical papers and holds more than 200 patents. He is not married.

Augustus B. Kinzel, former Vice President for Research of Union Carbide Corporation and former President of the Salk Institute for Biological Studies, delivered an address on "Research Decision Making" at an industrial research symposium at Illinois Institute of Technology. Referring to suitable conditions for surrounding industrial research, he emphasized the necessity for assuring good motivation and communications within the entire research operation as well as the need for effective communication between the research organization and top management and with other divisions of a corporate structure. In a recent letter from his home at 1738 Castellana Road, La Jolla, Calif. 92037, Gus writes, in part: "I retired from the presidency of the Salk Institute last fall and am now devoting myself to various boards and doing some consulting. I gave the Convocation Address and received an honorary doctor of engineering degree at the University of Michigan in September. Last July, I gave a Noranda Lecture on Industrial Research at Expo '67. Also, I have enjoyed serving on the National Academy of Engineering Committee on the Interplay of Engineering, Medicine and Biology. We thoroughly enjoy life in La Jolla. My commuting to New York, Boston and Washington several times a month keeps me in close touch with the business scene. It's good to know that you are still doing such a grand job on the '21 news." An international authority in the field of



Augustus B. Kinzel, '21

metallurgy, Gus was honored as a founder and the first President of the National Academy of Engineering. He is a member of the National Academy of Science and was also President of the Engineers Joint Council. His memberships and honors awards are legion. He is a board member of a number of important companies, including the MITRE Corporation, and has authored two books and more than a hundred papers and publications.

It is with profound sorrow that we record the passing of three of our classmates and express to their dear ones the sincere sympathy of the entire Class of '21. . . . **Joseph James MacDonald**, M.D., of 8 Parsons Street, Brighton, Mass. 02135, died on June 24, 1967. Born in Allston, Mass., June 8, 1898, Mac prepared for Technology at the Chauncy Hall School. During World War I, he was a Private in the S.A.T.C. at M.I.T. He was graduated with us in the Biology and Public Health section of Course VII and remained at the Institute from 1921 to 1923 as an Instructor in Biology. He received the M.S. and M.D. degrees from the University of Buffalo Medical School, where he also served as an instructor. In 1930, he opened his office in Brighton for the general practice of medicine. He served on the medical staff of St. Elizabeth's Hospital until his death and had also been an Instructor at Tufts Medical School. His memberships included the American Medical Association, Massachusetts Medical Society and St. Luke's Guild. He is survived by his wife, the former Camilla Keegan of Allston, Mass.; a daughter, Mrs. Camilla Wittig of Needham, Mass.; and a granddaughter, Carla. We are indebted to Mrs. MacDonald for aid in preparing these notes and for her cordial letter of thanks to the Class for its expression of sympathy. She has asked to be retained on the '21 roster.

The Rev. Father **Everett R. Harman**, Chaplain of the Daniel Freeman Hospital, 333 N. Prairie Avenue, Inglewood,

Calif. 90301, died on July 18, 1967. He was a native of Chicago, born on October 15, 1895. He prepared at Lane Technical High School and Armour Institute, Chicago, joining us in the junior year. At Technology, he was active in the Glee Club, the Architectural Society and was its Entertainment Chairman, and played the part of "Murad" in "Patsy," Tech Show 1920. He was a member of Delta Tau Delta and Scarab. During World War I, he served with the A.E.F. overseas in the Army Field Ambulance Corps. He was graduated with us in Course IV and entered the practice of architecture as a licensed architect, first with Sumner Spaulding and then with Wallace Neff, in California. He also taught at the University of Southern California. He had always aspired to be a priest but illness twice interfered. As a very young man, he had entered a Benedictine monastery in Scotland. Already a successful architect, he entered St. Patrick's Seminary, California, and came within a year of ordination before his health interrupted his studies. He obtained the M.A. degree in philosophy at St. Louis University in 1931 and did graduate work in psychology at both the University of Southern California and the University of California at Los Angeles. He was a vocational counselor in the Los Angeles adult education program from 1936 to 1939 and personnel administrator for several aircraft firms in the southern California area during World War II. He then served as Vocational Counselor for both the Veterans Administration in Los Angeles and U.C.L.A. and also as the Architect, General Manager and Executive Director in the building of several large housing projects by the Mutual Housing Association. He was later President and General Manager of Dapal Homes, Inc. He attended the Santa Barbara Mission and its Franciscan theodate and was ordained in 1949. He then became a priest at the Cathedral of the Madeleine, Salt Lake City. From 1955 to 1965, he was Pastor of Christ the King Church, Cedar City, Utah, when illness forced his retirement. He successfully underwent surgery at Daniel Freeman Hospital and retired to St. Andrews in Valeymore, Calif., but was again hospitalized and remained at the hospital as Chaplain until his death. Our classmates will recall his accounts of the arduous circuit duties he performed while at Cedar City and his invitation to the Class to stage a reunion in the vicinity so he could direct a tour through the several contiguous national parks. He attended the M.I.T. Centennial Celebration with the '21 group in 1961. Fr. Harman leaves two brothers, Arthur B. and Eugene, and several nieces and nephews, including Sister M. Viviana, B.V.M., Fr. Charles W. Harman, Assistant Pastor of St. Anne's Church, Santa Ana, Calif., who officiated at the Solemn Requiem Mass, and Gerald J. Harman, Jr., of the National Broadcasting Company staff in Burbank, Calif. We are indebted to Sister Mary Esther, Administrator of the Daniel Freeman Hospital, for her very con-

siderable help for preparing these notes and her gracious letter saying: "It was indeed a privilege having him with us for a while."

Olin Wellborn Scurlock, 3621 Hanover Street, Dallas, Texas 75225, died on July 21, 1967. Born in Cleburne, Texas, he received the B.S. degree at the University of Texas, joining us in the senior year in Course IV. He had been active in construction and real estate development in Dallas for more than 40 years, variously with the contracting firm of Wood and Scurlock, Olin Scurlock and Associates, and Suburban Business Centers, for the last two of which he was, respectively, owner and President. He helped develop the suburban area of University Park and was a volunteer worker in the Highland Park Independent School District. He was active in church affairs, especially for aiding young people and the underprivileged. He is survived by his wife, Mary G. Scurlock; a son, H. Gilson Scurlock; a sister, Claudia Scurlock of Dallas; four brothers, A.C. and Frank of Dallas, Dexter and Nelson of Ft. Worth; and three granddaughters. We appreciate Mrs. Scurlock's kind letter in response to the message of condolence from the Class and for her assistance in these notes. We are glad to have her request to be continued on the Class roll.

Month after month, we tell you about our real need for your news and, knowing your loyalty to '21 and your generous response to any request, we sit back and await an avalanche of mail. So break down that reserve or unnecessary modesty if you haven't helped us with a letter for many years or with the return of that personal data form—write now, dictate to a tape recorder or have your wife send the news. Do it right away before we have to get out the voodoo doll and a pin to wake up your writing hand!—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, c/o Edwin T. Steffian and Associates, Inc., 19 Temple Place, Boston, Mass. 02111

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Greetings from sunny, warm, rainy, chilly, beautiful Florida. Your Secretary is not retired, he is just tired. The sunburn will soon be replaced by tan and then comes that relaxed feeling of renewed energy—calling on **Frank Kurtz** in Delray who will provide the proper stimulant. . . . A letter from **F. Reed Dallye**, Rancho Santa Fe, Calif. 92067, tells us of his enjoyment of both the geography and climate after spending 37 years with Alcoa. . . . A good letter from **Roy A. Stone** of 15 Barnum Road, New Fairfield, Conn., has added names not previously listed who were at the Wianno Club for our 45th Reunion: Mr. and Mrs. George Bailey; Mr. and Mrs. Robert Cummings; Mr. and Mrs. Howard J. Duge; Hebert C. Ham of

Pittsfield; Mr. and Mrs. J. R. Hemeon of Trenton; Mr. and Mrs. C. Willis Stose, Narberth, Pa; Mr. and Mrs. Lewis P. Tabor and daughter; Mr. and Mrs. Arthur L. Wasserman, Hartford; Mr. and Mrs. Charles H. Whittum, Wayne, Pa.; and Mr. and Mrs. Roy A. Stone. Your Secretary is indebted to Stoney for this help. Their daughter Carol graduated from Western College for Women in Oxford, Ohio, in June, and is now enjoying child guidance work in Hartford. The Stones have a welcome mat out for any of the gang near New Fairfield.

. . . **Bill Russell** of Brookline has forwarded January clippings from Boston of M.I.T. and Harvard faculty members who protested the draft by organizing resistance groups. Bill definitely joins many others in opposing their stand.

. . . **Frank Westcott** of North Attleboro has been honored by the American Contract Bridge League at the winter Nationals in New Orleans. He has been elected Honorary Director for life. Frank was instrumental in forming and maintaining the National League and was the prime mover for bringing a National Bridge Tournament to Boston in 1970. He stands out as one of the great bridge players nationally and it gives us all pride to see him receive his latest honor.

Charles Herbert Taylor, Superintendent of Schools at Nantucket, was official host to Dr. Harold Wilson at the 82d Annual Meeting of the New England Association of Colleges and Secondary Schools in Boston. . . . We note that President Howard W. Johnson has explained the need for \$135 million in additional private funds within 10 years to provide adequately for the over-all needs of the Institute. Included is \$14 million for endowed professorships and faculty salaries. Our gift for the 50th Reunion will help reach this goal. . . . A most exciting Christmas letter has been received from Hardy and **Jack Liecny** of Phoenix, Ariz. Jack was invited to judge Corgis in New Zealand in February and in England in July. Here is their story: "February 3 found us flying to New Zealand (via Hawaii and Fiji) at the invitation of Miss Ellen Davis of Geraldine, South Island. It was her hospitality that really

made the trip so happy. New Zealand is a beautiful little country, with tremendous variation of scenery, from the thermal areas of the North Island to the fjords and snow-capped peaks of the South Island. The people are delightful and cordial. Besides all the 'doggy people' we met the former Ambassador to the U.S. who has returned to be in the Government, and through another contact had a tour of Parliament in Wellington, learning much about the problems this country faces. We zigged and zagged from north to south, back north and south again by plane, bus, boat and train, with Jack judging Corgis first in Geraldine, next in Auckland and then an all-breed show in Timaru. It was an altogether delightful three and a half weeks.

By then, through friends in Australia, Jack had invitations to judge there, and on March 1 we flew to Melbourne. What a lovely city and what dear people! The Graham Heads and the Reg Mitchells gave us entrée to everything and saw to it that we didn't have a dull moment or miss the sights. Jack judged a 'Parade' at the wonderful Dog Pavillion at the Show Grounds. Then it was on to Adelaide where he did an Obedience Class and next day an all-breed show with 450 dogs in one day! David Roche was our host, and no one could have done more to make us welcome. Adelaide is a beautiful city with lovely homes, gardens and wide beaches nearby. Then it was back to Melbourne to judge at an Obedience Trial and to Sydney with the Heads and Mitchells for the Easter Royal Show. What a show and what fun! There's nothing like it in our country. The Hingstons toured us to the beaches north and south Sydney. We visited the Dan Scotts, and Dan drove us to Canberra, the exciting 'planned' capitol. It's a wonderful and vital country. They love Americans and admire America! We just regretted that we didn't see it all, but it's so big! On Easter Sunday, Jack judged 200 Dachsies at a Specialty. He was flattered that the Kennel Clubs of both New Zealand and Australia accepted him (temporarily) as an all-breed judge and showed him all courtesies. On



The classic U.S. stamp collection of the late Barrett G. Hindes, '22, held in trust by M.I.T. for more than 15 years, was sold by one of New York's leading stamp dealers this winter; in all, the collection realized over \$165,000 for the Institute at public auction. The outstanding items in the collection were

these three "errors" of the 1869 issue printed, by error, with the colored centers inverted. The 15c, described as "the highest priced U.S. stamp," sold for \$17,500; the three together brought \$41,000. (Photo: H. R. Harmer, Inc.)

April 1 we headed East after a lovely time, with Jack having judged over 1,200 dogs in the two countries.

Next, it was a week in Fiji—a glamorous and exotic spot which is fast becoming a real tourist mecca, with new hotels and resorts going up, kindly people and duty-free shopping. We had the good fortune to have known previously Ratu George Cakotau, the head Fijian Chief, who, with his wife, entertained us at a wonderful 'feast' in their home. We toured by car from Nandi to Suva, then flew back to Nandi which is the airport for all Pacific flights. A 35-hour stop-over in Honolulu was all too short, but we couldn't resist a glimpse of our favorite spot in spite of seeing too few of our friends. . . . We had a bare month at home to pull ourselves together, and off we flew to Europe to see places and do things we'd not done before. We took delivery on a new Volvo in Frankfurt, headed for the 'Romantic Road,' on to Vienna for a week, back through Austria to Salzburg, then Munich and Bavaria, Ludwig's Castle, Liechtenstein, Switzerland from Zurich to Geneva, the chateau country of France, and into Paris for a week which we enjoyed in spite of Mr. DeG. And then it was to England. We had a few days in London to see friends, shop and renew our fondness for our favorite city. By then it was time for Windsor and the lovely dog show in the shadow of the castle. The show committee gave us a lovely weekend, and Jack judged 159 Corgis on July 1. We were then free to see our old friends who were truly wonderful in their entertainment of us and their real hospitality. We had three weeks of meeting people and seeing places in England and Wales, many of which were new to us and finally sailed from Liverpool on July 21, on the *Empress of Canada*, with our Volvo aboard.

By the time we landed in Montreal, we were anxious to get back to the U.S., and we took only a bird's eye view of Expo and headed for New England, making short stops in Vermont, New Hampshire, New York, Connecticut, Philadelphia, and Virginia, before arriving in Fort Worth to visit Hardy's mother and sister. This visit was prolonged when Mother (age 91) fell and broke her hip. We stayed on several extra weeks. So it was the middle of September before we got home. We had had two wonderful and exciting trips and felt that we were greatly blessed to be well enough to enjoy it all. We've had visits with Joan Jennings, her husband Allen and their four children, who are happy in Santa Barbara. Derek, his wife and young daughter are in Oakland, where Derek has had a fine year as Manager of the new Oakland Soccer team that won the National Championship. Hardy's nephew came home safely from Vietnam, and is reunited with his wife and two boys at Ft. Benning, having been decorated with a bronze and a silver star. Jack's business keeps him interested and on the go. Hardy

and Patsy (the last of the Corgis, now 10½) are enjoying some time at home with occasional weekends to dog shows. There have also been some sad times, for, in this past year, we have lost several of our dearest friends. We think of them so often and will always miss them. May 1968 bring all of you health and happiness. We've already heard from many of you and look forward to news of all. Now we are home for a while, so come to see us!" These trips seem to provide valid reasons for the absence of Hardy and Jack at Wianno last summer!

Just received word that **Earl H. Eacker** was married on May 12, 1967, to Mrs. Adele Joy Stromquist. Congratulations and best wishes to them both from all of us! . . . **Lloyd E. Raymond** of Stratford, retired Research Director for the Singer Corporation, has been awarded a plaque from International Service Corporation in recognition of his service as a volunteer consultant to a Brazilian metal products corporation. Lloyd had been with Mancal, S.A., in Sao Paulo, a manufacturer of custom-powered metal products for major Brazilian automobile manufacturers. He was Chief Metallurgist with Singer Corporation's Metric Division in Bridgeport for 25 years. He made many recommendations to help improve the quality and efficiency of Mancal's metal production and he has been invited to return to Sao Paulo to see first hand what effect his ideas have had on production efficiency. Before retiring in 1966 Lloyd set up Singer powdered metal plants in Scotland and Germany. . . . **Bill Mueser** sent a note calling attention to the death of **Dave Minton** who had been very ill. Bill and Dave, as well as **Sid Strauss**, were in the same class at DeWitt Clinton High School and continued their education together at M.I.T. This is sad news indeed and the sympathy of our Class is extended to Dave's family. . . . The 25th anniversary of the first self-sustained controlled nuclear chain reaction was celebrated in December, 1967. On the first "Enrico Fermi Team," which was instrumental in ushering in the Atomic Age, was our classmate, **Crawford Greenewalt** who prevailed upon Du Pont to build the first Plutonium Plant. We are proud that the combined efforts of these dedicated scientists who changed our way of life were furthered by a member of the Class of '22.

Your Secretary's secretary is receiving post cards from Florida showing flowers, sunshine and sandy beaches, indicating that he is having a marvelous and well deserved rest. While he sails out on the deep in quest of its large denizens, improves his golf under the benign sun and just absorbs the enervating air, we are pulling his office apart, relighting it and polishing it to a gleaming finish. . . . **Carl B. Braestrup** has retired as Director of the Physics Laboratory of the Delafield Hospital. He is continuing as a consultant a few days a week which permits living the year 'round at his

home in Sachems Head. . . . The sympathy of the Class is extended to Amy Baldwin, widow of **Rollin S. Baldwin**, of Reston, Va. Rollin worked for many years in the Naval Research Laboratory as Assistant Physicist and after his retirement ran the Garde Art Center of Vienna with Amy, who is a painter. . . . We also extend our sympathy to the family of Col. **Charles Thomas-Stahle** of State College, Pa.; and to K. W. Downing, brother of **Richard E. Downing** who passed away in January in Portugal. . . . Changes of address noted are: William J. Edmonds, Bainbridge, Wash.; Laurence B. Davis, Stonleigh, Bronxville, N.Y.; Samuel H. Reynolds, New Canaan, Conn.; Henry McAlphin Schley, Jacksonville, Fla.; Robert M. Chase, Ashland, Mo.; Elhanan Borucol, Hacarmel, Haifa, Israel; Carl W. Shattuck, Bevans, N.J. . . . We wish a very colorful bunch of spring flowers to you all.—**Whitworth Ferguson**, Secretary, 333 Ellicott Street, Buffalo, N.Y. 14203; **Oscar Horowitz**, Assistant Secretary, 33 Island Street, Boston, Mass. 02119

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45th Reunion; Blue Water Resort Hotel, Bass River; June 7-10, 1968; for reservations: Forrest F. Lange, 1196 Woodbury Avenue, Portsmouth, N.H.

The 45th Reunion will be held at the Blue Water Resort Hotel, Bass River (slightly east of Hyannis on south side of Cape Cod), June 6-9, 1968. Make all reservations as directed in the class mailings; your Class Secretary will be glad to answer questions and will be happy to receive news of your activities for inclusion in the *Technology Review*. Please keep him informed of your latest address. . . . You should have received class mailings giving specific information relative to our 45th Class Reunion, from Thursday night, June 6, at Bass River to Sunday, June 9, when we return to the Institute for Alumni Day, June 10. Your Secretary recently attended a dinner meeting at the Faculty Club in Cambridge of about a dozen representatives of all of the class reunions to be held this coming June. I understand that 10 of the reunions are to be held on Cape Cod. A wonderful program is being planned at the Institute, not only for Alumni Day but also for alumni who will be there on the Sunday evening before Alumni Day. For alumni who would like to discuss old times with their classmates and other M.I.T. friends, this is the year to do it. The Class Reunion, the Sunday evening activities at the Institute beginning with an informal buffet dinner and the Alumni Day activities will furnish an ideal opportunity to socialize, as well as to learn, at panel discussions, about such subjects as human aspects of technology, new engineering applications of the latest scientific discoveries and the technology of China today. The M.I.T. libraries are to acquire their millionth book. Alumni Day will end with good food, good entertainment,

and a surprise. For these reasons you are urged to have a serious conference with your family and attend the Reunion. It is important that you make your plans early, pay your \$10 class dues promptly, make your class reunion reservations, make your Alumni Day reservations at M.I.T. and reserve accommodations at the M.I.T. dorms for Sunday night if you want them.

Milt Parker writes: "Note that **Herman Swett** has retired, as advised in your Class Notes in the January, 1968, issue of *Technology Review*; whereas **Earle A. Griswold** is hibernating at Boca Raton, Fla., for surely he has not deserted his rustic retreat at Dingley Dell on the periphery of Palmer, Mass. **Frederick H. Chirgwin** is still Major Domo at his Daggett House on the Vineyard (Edgartown, Mass.)—incidentally, a delightful vacation spot for those who flee any of the four megalopolitan (sure like that adjective) regions as described by Kevin A. Lynch, '47, in the issue identified above. Have not exactly 'retired' from my recent stint as a Consultant to the Zonolite Division of W. R. Grace and Company inasmuch as I am 'retread' as a sort of manufacturer's representative and part time consultant in adapting vermiculite products as chelating agents in animal nutrition that promises to be my most stimulating, and possibly crowning, experience as a consulting food engineer. Incidentally, we are exploring certain areas of human nutrition as well that could have tremendous advantages in mineral metabolism and the like. Isn't it amazing how an earthy micaceous mineral could ever be found to be a significant nutritional component in animal feeds as we have already demonstrated? And we have hopes it might possess interesting human nutritional counterparts. I fully expect to be preoccupied with field work at the time of the 45th Reunion of the Class of 1923 but hope the good Lord will be willing for me to participate in the 50th. Regret that I had to withdraw from the 1967 National M.I.T. Alumni Officers' Conference in San Francisco last fall and hope your namesake representing the Chicago M.I.T. Club filled you in . . . Sorry that I am not as impressed with the new format of *Technology Review* as is my son Brian P. Parker, Class of '53 (see "*Correspondence Review*" of the January, 1968, issue), just goes to prove that the 'old order changeth giving way to the new!'"

Leander K. Poor reports: "Retired from Ford, Bacon and Davis, Inc., on December 31, 1966, as required. Accepted temporary assignment with Louis T. Klauder and Associates on January 9, 1967, and have been busy ever since. Work is fun when you don't have to." . . . **Martin H. Burches** reports: "Retired as Lt. Col. U.S.A. in 1952 after returning from Korea. Since then I have been aiding in the maintenance of the Estate of the Krotona Institute of Theosophy in the Ojai Valley. There are about 120 acres and numerous buildings.

Ida B. Webster, Partner in Edelbaum and Webster (architects), reports: "Firm just received award from New York State Association of Architects for a Mitchell-Laura Middle Income Co-op, Riverside Neighborhood Assembly House for 208 families on 96th Street between Columbus and Amsterdam Avenues (West Side Urban Renewal Program)." . . . **Pete Pennypacker** reports: "I have just been reading the February *Technology Review* and I am glad to see that we have such a splendid committee to handle our 45th Reunion. Doris and I are planning to attend the Reunion from beginning to end. Regards to all the gang as you see them. (I think Pete is setting a perfect example for all of us—why not you and your family? Sec.). . . . If you have any movies or slides be sure to contact **Alan Allen**, 525 Lexington Avenue, New York, N.Y. 10017, **Royal Sterling** or **Herb Hayden** as soon as practicable.

Word has been received of the following deaths but further information is not available at this time: **Bernard L. Chapin**, 5 Salisbury Street, Winchester, Mass. 01890, on January 15, 1968; **Harold H. Leary**, 39 Cullens Run, Pittsford, N.Y. 14534, on January 6, 1968. . . . The following are changes of address: **C. Arnold Dutton**, Parkway Apt. 1407, 151 Buffalo Avenue, Niagara Falls, N.Y. 14303; **Fred H. Travers**, 826 Douglas Road, Philadelphia, Pa. 19118; **Fernando de la Macorra**, Manuel Maria Contreras, 133-7 Piso, Mexico 5, D. F. Mexico; **Dale E. Washburn**, Driftwood Road, Rockport, Mass. 01966.—**Forrest F. Lange**, Secretary, 1196 Woodbury Ave., Portsmouth, N.H. 03801; **Bertrand A. McKittrick**, Assistant Secretary, 78 Fletcher Street, Lowell, Mass.

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It's really official now. We have had our last reunion at the Oyster Harbors Club. Over a year ago your officers were notified that the Club would no longer host class reunions. However, hope springs eternal. There seemed like an outside chance they might be persuaded to make an exception in our case. Then we learned that the outfit that controls the whole 93-estate area, Oyster Harbors, Inc., had decided to tear down the old club and replace it with a more modern structure, one without sleeping accommodations. In January, while in the process of being razed, it caught fire and in short order was a mass of smoldering ruins. That's about as definite as it can be. Our esteemed Executive V.P., **Russ Ambach**, is also our 45-Year Reunion Chairman. He's in the process of nailing down a worthy successor. . . . Most of the news that has come our way this month concerns retirements and attendant activities. **Dick Shea** says he's taking his consulting work a bit easier now, though he still hops back and forth across the country with some regularity. Among other things he's bird-dogging for Wiley. Got a good book in mind

and looking for a publisher? Richard may be just your man. By the way, any time you want to find the address of any alumnus, just drop a note to: *Alumni Register*, Room E19-437, M.I.T., Cambridge, Mass. 02139. If they have one, you'll get it right away.

Remember we told you last fall of all the praises heaped on **Henry Liebman** in New York when he was elevated to the post of First Deputy Commissioner of the Sanitation Department? So now he's retired, and well-timed too, before those garbage men went on strike. But that appointment should have been a good springboard for his new job. Henry is with a firm of consulting engineers in New York specializing in the disposal of solid wastes. And since that is one of our great national headaches, he should be a very busy man for the foreseeable future. . . . **George Tapley**, after a long career with the Army Engineers that sent him from the frozen wastes of Alaska to the steaming jungles of Southeast Asia, is now leading a more sedentary life. He went back to the old home town, Haverhill, Mass., and took over the job of City Engineer. "This function may continue for several more years, judging by the vast amount of work and lack of engineers." . . . **Clarke Williams** made a more drastic switch, from nuclear engineer to marine biologist, or maybe it should be oceanographer. Before last July, he was Deputy Director of Brookhaven National Lab on Long Island. Now he has a full-time job as Research Administrator of the Nassau Suffolk Regional Planning Board. Not at all sure what that covers. Maybe raising more and tastier oysters? Or possibly producing better Russian caviar from horseshoe crab eggs? (Don't laugh at that—you've probably eaten them.)

After 41 years with Dennison Manufacturing's Research Division, **Ernest Kallander** has become a country gentleman. "Am busily engaged in training bird dogs, small farming, wood chopping, building a golf course, (there's an unusual one for you), learning to ride a horse, and all. Would welcome a call from classmates at 485-3834." That's a Southboro, Mass., number. . . . **J. Herbert Grahame** is an old hand at the retirement business by now. He has been on his own for eight years. Bert and Mrs. Grahame have been living a life of leisure at Virginia Beach all this time, but now they're casting longing eyes at the West Coast, somewhere around the San Diego area. "It's said to have such a good all-year climate for retirees." . . . **Clint Conway** and Allora went from Maryland to Florida years ago, but it was just for a change of locale, not retirement. Now, however, it's coming up—matter of fact, shortly after these notes appear. The **Gordon Harveys** have been in Florida this winter, and spent a weekend with the Conways. Also **Cy Duevel** and Mary are down there again, sitting out the cold

Connecticut winter. They have an apartment in Sarasota and the Conways have seen them a few times. Clint can probably keep himself busy just arranging miniature '24 reunions in the area. . . . We've told you about **Paul Schreiber's** new job with the Midland (Mich.) Chamber of Commerce. Evidently that didn't keep him busy enough because now he has also taken on the job of President, the Paul Bunyan Council, Boy Scouts of America. It is the crowning achievement of 45 years in scouting. The list of his past offices goes on and on and on.

And now some quickies. **Jack McCoy:** "Have enjoyed over two years of retirement, with trips to Mexico, Arizona and California. We have moved recently to a smaller one-floor house, which we are enjoying also." . . . **Tien A. Koe:** "Retired two years ago. At the time I was Senior Associate and Chief Designer with a consulting engineering firm that specializes in the design of long-span bridges. Recent projects include Hudson River Bridge at Newburgh, and Beacon and Mississippi River Bridges at New Orleans and Baton Rouge." . . . **Gene Quirin:** "Now living part of the time in Raleigh, N.C., primarily to stretch the 'good weather' part of the year." . . . **Maynard Harris:** "Retired last December as Chairman of the Board, Suffolk Franklin Savings Bank in Boston." . . . **Gordon Joyce:** "Retired from New England Telephone and Telegraph Company in January 1967." . . . **Ray Forsyth:** "Retired January 31, 1968."

A note from **Dick Lassiter** says the "regular monthly luncheon of the New York Section, Class of 1926, took place at the Chemists' Club on January 10, 1968, with 11 present: Jack Tench, Ray Forsyth, Jack Lewis, Walter Bagley, Sox Kinsey, Griff Crafts, Will Blaisdell, Perry Maynard, Nate Schooler, Henry Liebman, and Dick Lassiter." A good group—do join them when you have a chance—second Wednesday after the first Monday. Dick and Bee were about to take off for a convention in Las Vegas, then on to San Francisco for a few days. The second part of the trip presupposes that Howard Hughes's boys had left them with the wherewithal. . . . Sorry to have to report four deaths. On February 2, while he was bowling, **Earle Bates** died suddenly. Earle was Class President our Junior year, as well as Captain of our baseball team. If memory serves correctly, he had just retired. Only dates are available on the other three: **Raymond E. Dorr**, December 12, 1967; **Frank C. Gilson**, January 3, 1968; and **John P. Brosnan**, October 23, 1967. On this sad note we leave you for another month.—**Henry B. Kane**, Secretary, Lincoln Road, Lincoln Center, Mass. 01773

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News of our classmates continues to arrive via the Alumni Fund Office.

If you have not already contributed this year, why not do it now and pass on a few words regarding your activities which will certainly be of interest to other members of the class? . . . As **Chink Drew** wrote me recently, this particular year is a year of change for many of the Class as they reach the age of retirement; and from the information coming in from those already retired, it appears that every one is making good use of his leisure time and, in many cases, keeping more active than ever before. . . . **Joe Russell** writes that after retiring in March, 1966, he and his wife went on a four-months' cruise, boarding a freighter at Houston. They went through the Panama Canal, up the west coast to British Columbia and on to Japan, Manila, Taipei, Hong Kong, then back to Japan, Seattle and again through the Canal. They stayed with the same ship most of the way and enjoyed excellent weather. They still have a daughter in college. They have sold their house and have moved into an apartment at 1119-D Post Oak Park, Houston, 77027. Joe plays golf every week and dabbles at some business activities. . . . **Marshall Baldwin** writes from San Rafael, Calif., saying he has been retired from the Standard Oil Company of California for about a year, after having worked for that Company for 38 years. . . . **Henry Hoar** writes from Williamsburg, Va., stating that since retiring in 1965 he has been enjoying life helping in the College of William and Mary's new library in the Rare Book Section.

Carl Mabley, Jr., from Huntington, W. Va., indicates he has retired; is doing Marketing Consulting; is very busy still and enjoying it more. . . . From Los Angeles, **Finley Laverly** notes that he and his wife have recently returned from a trip to Europe and Asia Minor which combined business and archeology. After a week in Istanbul at the ninth Congress of the International Commission on Large Dams, they toured dams under construction as far east as the Euphrates and archeological explorations in Turkey and the Greek Islands. Following a trip through Italy, their five-week tour was completed at the hydrology and meteorology sessions of the International Union of Geodesy and Geophysics in Bern and Lucerne. He notes that the archeologists have discovered much that the engineers have had to relearn. . . . **Frank Klein**, from his home in Mountain Lakes, N.J., notes that he retired from Esso on August 1, 1965. For the past 25 years he has been busy with aviation engineering. He notes that he is greatly enjoying doing nothing serious after 40 years of hard but delightful work with the U.S. Air Force, the Martin Company, and Esso. . . . It was noted in the Boston *Herald-Traveler* a few weeks ago that **Maurice Freeman** of Loomis Sayles and Company, Inc., has been made a Director of the New England Mutual Life Insurance Company. . . . Among address changes noted in the past month is one for **Melvin Shikes** who

has been in Wellesley Hills, Mass., and is now at 10619 Camden Avenue, Sun City, Ariz. 85351.—**F. L. Foster**, Secretary, Room E19-702, M.I.T., Cambridge, Mass. 02139

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A dry n'oreaster churned the ocean so much this week that our sliding glass doors are so salty they look as though they were covered with city dirt. And there is nothing to do about it because the temperature proceeded to drop to 15° above zero. The sun is streaming in beautifully though, so with back turned to the windows we can take a look at the '26 file. A couple of months ago I told you about the excitement caused on Cape Ann when it was learned that the government was safe-keeping a Mafia witness on an island one mile off shore. Last week the lawyer for the witness turned on the ignition in his car and it blew up severing his leg and nearly killing him. The Mafia witness is no longer being kept on the island but rumors have it that he is being "protected" on an estate not too far from here. Let's get over to '26—more about Cape Ann later. We have quite a folder of clippings but here's one that surprised us from *Swimming Pool Weekly*, a publication we had no reason to know existed but leave it to our red headed classmate to find it! Here's Part II "Is a Pension Plan Suitable for Your Company's Needs" by **I. Austin Kelly, III**. I won't quote the article but right smack in the middle he starts off "Case Number 1—The Smith Company, a small, long established swimming pool contractor in Ohio was owned solely by George Smith," and the final paragraph is, "The Result: if the present formula is maintained, this owner will have accumulated, at retirement, more than \$250,000 in pension deposits and interest earnings. Also since his company is in the 52 per cent bracket, the largest share of this sum will be in dollars which would otherwise have gone into taxes." All right now, Austin—you used my name—I gave you more publicity—where's my cut?

Howard Humphrey sent us a page from the *Wilmington, Delaware News* which carried a long story that starts off: "**James Q. du Pont**, whose talks about Du Pont Company history and the chemical industry have won him a nationwide following, retires from the company this week. As an Administrative Assistant in the Public Relations Department for 15 years, Du Pont has spoken extensively throughout the United States, Canada and Mexico. He is a great-great-grandson of the founder of the company." We knew you were retiring, Jim—why don't you write and tell us what you are up to now? What about that idea of yours for making it easy for the old, the decrepit and the lazy to pull on their overshoes? . . . Another retirement comes in a Union Carbide release. "**Phil Hendee**, Manager of Mechanical Equipment

Design for Union Carbide's Engineering Department at the Technical Center, is retiring this week after 33 year's company service. A native of New Haven, Conn., he is a mechanical engineering graduate of M.I.T. A bachelor, Hendee makes his home in South Charleston. He plans to remain in the area for the near future, but will spend summers at a family farm in Nova Scotia." . . . We received an address change recently that caused us to believe another classmate had retired. A clipping from the Salem (Mass.) News confirms this. "**Edgar F. Stevens** of 112 Atlantic Avenue, Marblehead, Manager of the Electric and Steam Sales Department of Boston Edison Company, was guest of honor at several luncheons given by his associates upon his retirement September 1. Mr. Stevens has been with the company for 40 years, was graduated from Massachusetts Institute of Technology with a B.S. degree in naval architecture and marine engineering. He and Mrs. Stevens will move to their new home in Naples, Fla., this month." . . . Recently we answered a *Wall Street Journal* ad on Naples, which said there would be no follow-up, and received a beautiful brochure on a place called Port Royal. Looks like a nice spot but its still pretty nice here looking out over that ocean, even at 15°.

Since we seem to be on a retirement kick, let's look at a couple more and call it a day. The next one is from a classmate who retired last summer from an active business career and is now having a grand time teaching school. He ends his note with the comment that he probably was the least successful of our famous class. I'm sure it was said in jest because it did not fit his record. However, it reminded me that at our 40th Reunion the most illustrious member of our class made a speech. It was a very modest speech and in it he paid homage to the greatness of our class. I'm referring to **Jim Killian's** acceptance speech of the Class of '26 gift. Thanks to **Eliot Bidwell** and **Tom Green** it was taped and your Class Secretary is the custodian of the recording. After reading this last class note I decided to play back the tape and find the part that I remember best because, in addition to acknowledging the high places achieved by '26 men in top management of our leading corporations and as masters of their professions, Jim took cognizance of the many others who make up a large numerical part of the class. I cannot write shorthand but by playing it over and over I picked out the following: ". . . and those people not in the limelight and living quietly who have added to the development and to the substance and integrity of our society." Our anonymous classmate has apparently found a quiet niche, upon retiring, in the educational system and what could fit Jim's definition more perfectly! Sometime I want to get Jim's entire speech down on paper and make it available to the class. It's a document to be treasured by every member of the class. Our collie, Heather,

has just informed me that it is time to stop writing class notes and to take her for a run on the beach so until May—Cheerio.—**George W. Smith**, Pigeon Cove, Mass.

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Donald L. Ross died on November 18. His home was in Longmeadow, Mass., at 583 Shaker Road. Don came to Tech in his sophomore year from Union College and graduated in electrical engineering; he was undergraduate News Editor of *VI-A News*. His business career was entirely with Westinghouse Electric Corporation, mostly in the Springfield area. A past President of the Connecticut Valley M.I.T. Club, he was also active in Springfield civic affairs. . . . **Paul Vaughan** has retired from the post of manager of Engine Development and Product Engineering at Alco Products, Inc., division of Studebaker-Worthington; he will continue in a consulting capacity. As he put it, he spent his efforts developing "the best diesel engine in the world." His home is still at 1476 Myron Street, Schenectady, N.Y., but the paper says that he hopes to retire to Cape Cod. Paul wrote me that he wants to take a look at eastern Connecticut too, and I hope he does.

Harland Sisk, who retired from G.E. last year, has taken up the treasurer's job for the *Cape Cod Standard-Times'* Neediest Families Fund. His new home is in Yarmouthport and he had been a longtime summer resident of the Cape. . . . **David Knox** has retired from the position of Manager of Process and Development for Bundy Corporation in Detroit. In Huntington Woods, Mich., where he lives at 10474 Lincoln, he was once Mayor and member of the City Planning Commission (see class notes, *Technology Review*, July, 1965). . . . To wind up the retirement news, two new addresses in Florida can be reported and I hope the classmates involved will write us some of the sunny details: **Louis F. Eaton** moved from Duxbury to 656 5th Avenue North, Naples, Fla. 33940; and Elwood Church left the Boston Edison to take up abode at 8003 Seminole Boulevard (Lot 28), Seminole, Fla. 33540. . . . Other new addresses are: **Carroll C. Bailey**, 191 Oak Place, Fair Haven, N.J. 07702; **Franklin T. Kurt**, 15 Highland Court, Huntington, N.Y. 11743; **Francis F. Mevay**, 390 Andrews Road, East Williston, N.Y. 11596.—**Joseph S. Harris**, Secretary, Box 654 Masons Island, Mystic, Conn. 06355

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40th Reunion; McCormick Hall, M.I.T. Campus; June 7-10, 1968; for reservations: Abraham Woolf, 15 Court Square, Boston, Mass., or Mrs. Ralph T. Jope, 37 Dix Street, Winchester, Mass.

First news first: Plans for our 40th Reunion have reached the final polishing

stage. **Ed Poitras** has confirmed reservations for well over 100 members of the class and, of course, most will be in attendance with their wives. **Jim Donovan** states that returns for the Class Gift are only fair; but our friend Jim has never been a great optimist, and we are sure that by June 1 the amount of money contributed will not shame the Class of '28. The Class Book Committee of **Charlie Worthen**, **Walter Smith** and your Secretary spent all Friday afternoon, February 9, reading completed questionnaires and sorting out the wheat from the chaff. We have over 250 biographical sketches and we expect to send out another mailing early in March in a final endeavor to increase this number appreciably. As a matter of fact, your Secretary has enough material from the questionnaires to fill many pages of class notes, but we shall resist this easy way of writing our column in order that recipients of the books will read with some element of surprise as well as pleasure. Another meeting of the Reunion Steering Committee was held at the Faculty Club in Cambridge on January 30, and we expect to hold two or three more such meetings before June in order to iron out every single detail that needs attention. We had intended to include in these notes a complete list of those who are definitely coming to the Reunion but we have missed connections with Ed Poitras and the summary, in final, must wait until our May class notes.

From Florence Jope we produce a few notes taken from the Christmas cards she received. Ethel Bernhardt from New York: "Hope to see you in June, if everything goes well." Adrienne and **Art Josephs** from Minnesota: "Yes, we look forward to June." **Carl Myers** and Frances from Florida "We are looking forward with great pleasure to seeing you this June at the 40th Reunion." **Loius and Ernie Knight** from Maine: "We are living in the cottage all winter, and it is wonderful here, even today with no power after the ice storm last night." Betty and **Dud Smith** from California: We will not be taking in our 40th Reunion. Sorry . . ." Anne and **George Palo** from Tennessee: "I can't tell you how we are looking forward to our 40th Reunion and the chance to see our dear friends." Verna and **Rudy Slayter** from Weston: "Just returned from a brief hunting trip in Machias. Saw no deer but at dusk of the last day Rudy met a huge



Paul S. Vaughan, '27



Howard P. Emerson, '28

400-pound black bear." Alice and **Slim Maeser**: "Flew west in July for three weeks visiting relatives and points of interest. We look forward to seeing you in June." **Shikao Iekihara** from Japan: "With happiest anticipation." Florence lists the names on about 25 other cards she had received for Christmas.

We also have a batch of Christmas cards that were received by Jim Donovan. Many of these have messages but most of those who wrote will be at the Reunion. . . . A note from **Duncan Whittaker** says: "I spent February and March '67 in Perth, Australia, on a business assignment, stopping at Hawaii, Fiji, and Sydney and returning via Singapore, Athens, Rome and London, thus completing the circuit around the world. In July I retired from my position as Chief Electrical Engineer with Dravo Corporation, Pittsburgh. After June of 1968 I will make my home at Cliff Island in Maine, where I will spend my leisure time building 'the home' of my own design." . . . And from **Henry Buntschuh**: "Excepting for a trip to Europe in '66 and a trip last spring to Wilmington, N.C., for the azalea festival, I have been busy at home doing many needed things. Also have been flying back and forth to Bedford, Mass., to visit son Charles, '53, his wife and three little girls and to Hightstown, N.J., to visit Bob, '55, and his wife and two sons. Charles is with Microwave in Lexington, Mass., and Bob is with the R.C.A. Space Center in Princeton, N.J." . . . A note from the Foxboro Company of Foxboro, Mass., tells us that **Walter Ridley**, XV, has retired as Manager of the Textile Industry Sales Division. After nearly 40 years in the textile machine and process control industries, Walter will serve as Consultant to the division.

Dave Ingle, President of L. B. Jones Company, Inc., of Evansville, Ind., represented the Institute at the inauguration of Wallace Billingsley Graves as the 20th President of the University of Evansville on February 20, 1968. . . . And **John L. Barnes**, VI-A, U.C.L.A. Professor of Engineering, is state-wide coordinator of a program concerned with holography, the new technique of image forming in coherent light. "Holography and its Applications" will be described in a series of 14 weekly lectures throughout California. . . . **Howard P. Emerson**, who established the University of Tennessee's Department of Industrial Engineering 20 years ago and has guided its growth to national accreditation, is giving up the headship to accept a new challenge at U.T. Beginning January 1 Professor Emerson will devote full time to teaching and promoting new programs in the development of local industries in Tennessee, announced Dean Charles H. Weaver of the U.T. College of Engineering. "We are deeply indebted to Professor Emerson for the work he has done in organizing industrial engineering at U.T., and we are behind

him 100 per cent in his efforts to increase the University's effectiveness in helping the state's industrial development," said Dean Weaver. In recent years Professor Emerson initiated a special course in developing local industries at U.T., and the department has also undertaken a major project to help localities increase industrial growth. These are the new programs to which he plans to devote full time beginning January 1.

Professor Emerson not only established U.T.'s Industrial Engineering Department in 1947 but he also helped in the development of the American Institute of Industrial Engineers that started the next year. He was President of the national organization in 1956-57, and was honored as a lifetime Fellow in 1964. He came to U.T. from the Tennessee Valley Authority, which he had served from its founding in 1933—first as Industrial Engineer, then as Assistant to the Director of the Commerce Department. While with T.V.A. he taught a few evening courses at U.T. and recalls that his initial salary for those services was "the privilege of buying football tickets at faculty rates." A native of Manchester, N.H., Professor Emerson earned a bachelor's degree at Dartmouth College and an S.B. degree in electro-chemical engineering at M.I.T. He taught at Robert College, near Istanbul, Turkey, between the times he earned the two degrees. In addition to his U.T. and T.V.A. services, Emerson has been active in other professional developments in Knoxville. He helped to organize both the East Tennessee Chapter of the American Institute of Industrial Engineers and the Knoxville Chapter of the Society for Advancement of Management. He also helped found the Great Smoky Mountains Ski Club. His wife, a native of France, is President of the Knoxville Alliance Francaise. Their daughter, Mary Ginette Emerson, teaches in the city schools.—**Hermion S. Swartz**, Construction Publishing Company, Inc., 27 Muzzey Street, Lexington, Mass. 02173

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It was most gratifying to your Class Secretary—just as the last bit of material on members of our class had been exhausted—to receive three very thoughtful letters from **John Dreyer**, **Leonard Peskin** and **Eric Bianchi**. These were all so interesting and newsworthy we will quote them just as received. . . . John Dreyer wrote January 17 from Cincinnati, Ohio: "Your note about **Warren Walker** in the January Review prompts me to write. I always turn to the '29 page. Your continued work with it is appreciated. What is my news? I now have my two sons working with me. Not only are we producing light polarizing filters and rear projection screens but we are in photochromics and liquid crystals. All specialties having to do with the control of light. We get Christmas cards

from **Henry Gibbons** and family, but otherwise can't get him to write. Have hopes of getting to Boston for the 40th Reunion and wonder how many of you I will recognize (and will I be recognized?). Guess we all are thinking about retiring but planning to keep busy at the same time." Thanks, John, for bringing us up to date—looking forward to "recognizing" you at the Reunion.

From Conshohocken, Pa., Len Peskin writes: "Having very recently taken a new and fundamental step in my business career, I thought I would heed Eric Bianchi's request to drop you a line. On November 15 my company, Thermal Research and Engineering Corporation, which I founded in 1948, became a wholly owned subsidiary of the Cosmodyne Corporation of Torrance, Calif. We make a substantially larger combination with four manufacturing centers in Los Angeles, Louisville, Cleveland and now in Conshohocken. I am Senior Vice President and a member of the Board of Directors of the parent company. I have given up direct line responsibility to my younger associates and am concerning myself with corporate development, particularly as that relates to new products, mergers and acquisitions. My new associates are an active, aggressive group whom I enjoy very much and with whom I find interesting new horizons. My two sons are both married. Our eldest, Richard, is a Professor of Mechanical Engineering at Rutgers University and consultant to a number of important corporations and government agencies in the technology of fluid flow, with special emphasis on problems of turbulence and two-phase systems. He is the father of our two delightful granddaughters, ages 7 and 5. Our younger son, Henry, is a top economist with the government



Romeo H. Guest, '29 (left), is one of North Carolina's best known industrial builders. With Mr. Guest, who founded and serves as Board Chairman of Romeo Guest Associates of Greensboro, N.C., is Walter W. Harper, who recently joined the firm as President. They stand in front of the Guest-built plant of Celanese, Incorporated, in Charlotte.

in the Office of Emergency Planning. He is located in Washington, D.C., and he also teaches Econometrics at George Washington University. While we are hopefully looking forward to his contribution of grandchildren, for the time being he and his wife are offering as a substitute two Siamese cats of opposite sex, which only economists would name, Input and Output. As implied, my younger daughter-in-law is an economist with the Federal Reserve. My older daughter-in-law is a programmer with a research organization in Princeton, N.J. Between the four of them, Martha and I have a headache keeping up with the conversation. Anyhow, it's great fun. We have occasions to travel and we will be leaving soon for a trip around South America. We will be looking forward to the 40th Reunion." Certainly appreciate your letter, Len.

Kay and Eric Bianchi spent three weeks in San Marino, Calif., during the Christmas-New Year's holidays, where they attended their son's wedding and also enjoyed the Tournament of Roses and the delightful weather in southern California. Eric writes: "While in San Marino, I had the opportunity of talking with **Joel M. Whitney, II**, who is engaged in design engineering for Douglas Aircraft Company at Long Beach. Joel has been with Douglas for 20 years and seems quite happy with his work and living conditions. He kindly agreed to help **Bill Bowie** in personal solicitations of some of our classmates residing in the Los Angeles area. The Whitney's have two children, a son and daughter, both married and both living in California. I also had the opportunity of talking with **Sam Shaffer**. Sam is Treasurer of the May Company, a chain of department stores in the Los Angeles area. At the present time, Sam is extremely busy installing an N.C.R. computer system to handle the accounting problems of the May Company. **Bill Baumrucker** has kindly accepted the Chairmanship of the 40th Reunion Committee and will be looking to people in and around the Boston area to give him a hand with planning this event for June, 1969." That was a nice informative letter, Eric, many thanks. . . . We were delighted to learn from **Frank Mead** that **Hugh Hamilton** has just agreed to take on the important job for M.I.T. of what is called Estate Secretary. Many gifts to the Institute are on a deferred giving basis or income plan which has come to be a significant part of the funding deriving from the estates of interested and philanthropic people who believe deeply in the importance of fine education. Hugh was honored at a luncheon with President Johnson and subsequently at Endicott House with James Killian, '26. We note Hugh is now residing in Boca Raton, Fla. . . . Saw **Ed Farmer** late January and found he was heading for Ft. Meyers Beach for six weeks. Kindest regards to all.—**John P. Rich**, Secretary, P. O. Box 503, Nashua, N.H. 03060

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Those of you who live in the Boston area, and perhaps those in other areas as well, may have noted that N.E. Mutual Life Insurance Company has taken over Loomis, Sayles and Company, Inc. As an incident of this acquisition **Jim Morton**, who has been Vice President of Loomis, Sayles for a number of years, has been elected a Director of N.E. Mutual. The Morton's daughter Joanne, a Skidmore graduate, was married in December to Kimble Clark who is a Stanford alumnus and is studying for his Ph.D. at Purdue. . . . As reported in the January Notes, Arthur D. Little, Inc., has formed a subsidiary, 500, Inc., to develop and manufacture specialized cryogenic equipment and **Jack Latham** is President of the new company. More recently it has been announced that 500, Inc., has entered into a distributorship agreement with Sulzer Brothers, Inc., covering the development and sale of turbine-type, extreme-low-temperature systems in the U.S. and Canada. The parent Sulzer company is based in Zurich and is a major manufacturer of heavy equipment, such as marine and stationary power plants and looms. A.S.M.E. is very nearly a Latham private project this year. Ruth is National President of the Women's Auxiliary and Jack is Vice President, research. To make sure there are no dull moments, Jack devotes his spare time to developing blood processing equipment. Also he is a Trustee of the Eliot Savings Bank and of the Central Congregational Church and a Corporator of Massachusetts General Hospital. The four Latham children have now acquired a total of six M.I.T. degrees. William has a B.S. and M.S. from M.I.T. and is a cryogenic engineer with Process Equipment. Harriett is married to Dr. William Robinson who is on the staff at Stanford University. She has a B.S. from Swarthmore, an M.S. and Ph.D. from M.I.T. and is doing post-doctoral research at Stanford. David has a B.S. from M.I.T. and is working toward a Ph.D. in astrophysics at Harvard. Tom, who accompanied his parents to the 30th Reunion, has a B.S. from Cal. Tech., an M.S. from M.I.T. and is now studying at the Woodrow Wilson School of Public and International Affairs at Princeton. The Lathams have eight grandchildren.

Charles Gale is planning to retire as of August 1, 1968. As reported last March, he is Advertising Manager—Publications—of American Oil Company in Chicago. . . . **John Mathews** retired from the Air Force in 1957 and thereafter studied international politics at University of Maryland. For the past several years he has been a consultant to Rep. Paul Findley on the Atlantic Community. . . . **Phil Holt** has been named Coordinator of the recently formed Corporate Services Staff of Esso Research and Engineering Company. . . . **Earl Krall** is Director of Statistical Services, Boy Scouts of America, at the national headquarters in New Brunswick, N.J. He is also a

Director of Y.M.Y.W.H.A. and a Lions Club Deputy District Governor. The Krall's older son Martin has an A.B. from Rutgers, an LL.B. from Yale and is now an Air captain assigned to the A.F. general counsel's office. Younger son Charles is a senior at Quinnipiac College, Hamden, Conn. . . . As of December 1, 1967, **Jean Kresser** became a Fellow Engineer of Westinghouse Electric Corporation. His work involves consulting on major electric utility projects on the Pacific Coast and Hawaii in respect to equipment selection, relaying and control systems design and automation. He has been a member of the Westinghouse President's Honor Roll "the last five consecutive times."—**Gordon K. Lister**, Secretary, 530 Fifth Avenue, New York, N.Y. 10036

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Recent word from **John Elting**, via ham radio, reports that he is well and has recently had another grandchild. . . . **Fred Nordsiek** tells me that he has changed jobs as of January 1, 1968, and is now Director of Grants Management for St. Luke's Hospital Center in New York. . . . Congratulations to **George Bunker** upon his election to the Board of Sperry Rand Corporation. George is President and Chief Executive Officer of the Martin Marietta Corporation.

The November, 1967, issue of *This Month At Lehigh* reports that **Jim Fisk** received an honorary degree at Lehigh. . . . Although it appeared in the July, 1963, issue of *Foreign Affairs*, your Class Secretary just received a reprint of **Emilio Collado's** article "Economic Development Through Private Enterprise." It's well worth reading. . . . With sorrow I report the deaths of **Bronislaus J. Gdrewicz** on December 24, 1967, and **Robert D. Knight**, in August, who was stricken while playing golf at the Charters Country Club. Bob was a U.S. Steel Company executive.—**E. S. Worden**, Secretary, 35 Minute Man Hill, Westport, Conn. 06880

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Charles B. Bradley writes that he is happily retired in beautiful Santa Clara Valley, and as one of his retired friends put it, "It's the best job I ever had." . . . **Robert S. Prescott**, who has been with Honeywell since 1955, writes: "This was a busy year. Our second son, Theodore, was married to Catherine Porter, in Walworth, Wis., in July. Theodore is in New York City where he is in sculpture and his wife is a teacher. Our oldest boy, Robert, was married in 1966, and he and his wife are in Rochester where he is in surveying and his wife in teaching." . . . **Charles B. McCoy** has been elevated to the Presidency of Du Pont. He becomes the 12th President of Du Pont and the second man to head the 165-year-old company from outside the Du Pont family. We gave a summary of his career several months ago when he was made

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see page 78

Vice Chairman of the Executive Committee. . . . **William Kirkpatrick** was re-appointed to the Board of Control of Grand Valley State College at Allendale, Mich. William is President and Treasurer of Kalamazoo Paper Box Corporation in Kalamazoo, Mich.

Francis S. Chambers retired in December, 1967, from the Research and Development Division of Du Pont's Explosives Department after more than 32 years of service with the company. He received his doctor's degree from M.I.T. in 1937, joined the Du Pont Explosives Department at Gibbstown, N.J., and in 1942 was transferred to the organization formed to carry out Du Pont's part in the government's atomic energy program at Oak Ridge. In 1944 he returned to Wilmington as a Technical Specialist and a year later moved to the Eastern Laboratory. He became Section Director of the company's Atomic Energy Division in 1950, was promoted to Process Manager, Manufacturing Division, in 1953 and became Process Manager of the Research and Development Division in 1960. Francis lives at 309 Dickinson Avenue, Swarthmore, Pa.—**Elwood W. Schafer**, Secretary, Room 13-2145, M.I.T., Cambridge, Mass. 02139

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35th Reunion; Chatham Bars Inn, Chatham; June 7-10, 1968; for reservations: James Turner, 133 North Main Street, Meadville, Pa.

Class President **Edward S. Goodridge** reports: "I attended the last Reunion Committee meeting in Cambridge and

was very much pleased with the progress. In keeping with the suggestion of the Alumni Association, we should elect a new President next June." Goodridge Engineering is now the Electrostatic Equipment Corporation of Fairfield, Conn. Ed continues: "After two years of research and development, we have now moved and are in production." His wife Isabel is well; son Bill is graduating from North Carolina this January and will join the firm; the eldest Goodridge son, Walter, has left for Tokyo to manage a plant; and Ed's youngest son is a freshman at Washington and Lee University. . . .

Rodger Congdon is Assistant Controller of the Weyerhaeuser Company, Paper Division, in Fitchburg, Mass. Rog met his wife Jean in Ester Park, Colo., while travelling there in 1946. They were married in Denver and then returned to New England where they have been located ever since. They have one son who is a freshman at Washington University in Saint Louis. . . .

Fred Murphy tells us: "My three oldest are through college and the two eldest girls married last year. The oldest son is in the Coast Guard in Honolulu. The second son is in Moses Brown School—college next year. Girl number three is in high school and is an honor student—unlike her father. The two youngest boys are in the sixth and fourth grades. These last two will go to college on my Social Security." Fred had a nice visit with **Ellis Litmann** while he was at the Institute for a meeting. He also sees Westy occasionally.

Neil Hopkins, II, brings greetings from York, Pa. Hop went with York ice in 1934, after he received his advanced degree at M.I.T. To quote: "Except for some years a Research Head, prior to a merger with Borg-Warner, my activity has been mainly at the engineering level." He sent along a booklet describing the York products and says: "The booklet refers to a number of projects in which I had a most active engineering part, including Elgin Field Refrigerated Hangar, the Naval Ordnance Station, the exhaust gas coolers and many of the altitude chambers." The booklet also describes a very recent product, the Hyperbaric Chamber, which is used in medicine for proper control of temperature and humidity when heating, fogging and cooling problems occur. He goes on to say: "I am at present working on the product development end of heat powered refrigeration systems of which the absorption system is an example." Neil's daughter Mary, who is a sophomore and on the Dean's List at Pembroke College, was at home for the Christmas holidays. His son Bobby is a sophomore in high school where he seems to be majoring in basketball—he is over six-feet tall. Hop is a gardener and flower raiser. Unfortunately the Hopkines will not attend the 35th Reunion as Ruth is not well. Hop sees **Ellery Clark** once in a while. He thinks that **Steve Crick** will be interested to know that he played his second game of golf (the first was with Steve) and ended up in

a cloudburst. . . . **Bob Wellwood** is interested in antique autos; he had a V-12 Cadillac which he has sold, and now owns a '29 Lincoln and a '29 Minerva. Bob works for Ford Motor Corporation. . . . **Bob White** lives on Four Story Lane in Torrington, Conn. It is a dead-end street and is about four stories higher than the center of Torrington. Bob is General Manager of the Bearings Division of Torrington Company. The Whites have four children; three of them are out of school and one is a sophomore at Dartmouth. Bob is twice a grandfather—two boys, sons of his eldest daughter who graduated from Connecticut College in 1961. The second eldest, a son who graduated from Worcester Polytech in 1964, is also married. The third child, a girl, graduated from Connecticut College in 1967 and then spent five months in Europe. Bob has dropped all of his hobbies but one—golf—and he is looking forward to a few games at Chatham Bars come June. . . . **Joe Wetherell**, an old reunion attendee from way back, hopes to make the 35th. Joe is with Sperry Gyroscope and looking forward to retirement. His son would like to be a writer. Joe's wife Diana has been ill and we all hope she recovers soon. His retirement plans include a new home in Vermont.

Ron White, IV, has been involved in bank and savings and loan buildings architecture but is really interested in recreational architecture. He was Walt Disney's Consulting Architect on the G. E. Exhibit and Building at the New York World's Fair. He also designed a merry-go-round building, something one seldom sees today. At present he is in the process of designing animated cavemen, full size and funny, which will be used at a new amusement park in Santa Cruz, Calif. Ron says: "You never know where architecture will lead you." You fellows all know the story of **Bill Reed** making coast defense gun emplacements into swimming pools, don't you? . . . **Allan C. Vaughan, III**, from Midvale, Utah, is Assistant Director of Research with U.S.S. and R. He is an avid gardener and enjoys music. Al's daughter Janice has two girls, ages 1 and 6; his daughter Lois has three boys, ages 5, 4 and 1. Now and then Al travels to see Janice on the West Coast. . . . **Carl G. W. Jensen** of Jackson Heights, N.Y., is a civil engineer with Burns and Roe, Inc., Hempstead, N.Y. He is concerned with the structural design of nuclear laboratories and power plants. Before coming to work for Burns and Roe, Carl spent five years with H. K. Ferguson Company. He is a stamp collector specializing in Swedish, U.N. and U.S. stamps. On weekends he gardens on his one-acre plot in Bridgewater, Conn.

Berj Tashjian has been living in Northbrook, Ill., since 1965. He is the Chairman of the 1968 Platform Committee and is active in Village Caucus and charity drives. Last year he sang with the Chicago Symphony Orchestra Chorus and was soloist with the Forest Church Choir. Berj received the Governor's Award for

his design, one of 20 chosen from over 1,400, for the Illinois Sesqui-centennial Stamp, 1968. A poem written by Berj, "Troupers," was published in the winter issue of *Ararat*. Berj also has the distinction of being listed, 1965-66, in *Who's Who in the Mid-West*. He has three children: Charmian, 18; Bidu, 12; and Eugene, 10. The entire family is interested in music; Charmian is studying violin at Northwestern; Bidu is studying violin, cello and piano; Eugene also studies violin, although his major love at this point is baseball; Berj's wife Mildred teaches piano and is a contralto soloist at Ford Auditorium and in the First Presbyterian Church. Berj says: "Mildred and I have had the special honor of having a Gordon Young (composer of sacred music) anthem dedicated to us."

A note from **John Wiley** says that he has moved from 69th Street, New York City, to 79th Street, also in the City. John is in the airport business, and he enjoys skiing. He is "looking forward to the 35th in June." . . . **Bob Dillon** is at the Taft Plant (Union Carbide) in Hahnville, La. . . . Our Treasurer **George Stoll** and his wife Jane are off on a month's trip to Panama. They will be back March 4. . . . From the "Canadian Column" of the *Fort Lauderdale News and Sun Sentinel* comes this story about **Bob Winters**: "Trade and Commerce Minister Robert Winters has confirmed his decision to quit the government. He first revealed his intention to reporters last weekend when he sharply criticised his colleagues in the Cabinet." Bob told reporters that he would not run in the Liberal Leadership race in April. He intends to hold his York West seat in the Commons until the election and then return to private life. He compared the Cabinet to a badly split board of directors and spoke strongly against the government's fiscal record where, he contended, he could have done better himself.

Ken Moslander's son will graduate from Wisconsin on June 10, Alumni Day in Cambridge, so Ken will be unable to make the Reunion. He reports that both of his daughters have married since our 30th Reunion and he is now a grandfather. The Moslanders spent a month in Europe last summer "upsetting the trade balance." . . . In reply to that question of mine concerning the Honorary Musical Society, Baton, **Bob Smith** writes that he can only remember the Key. Bob intimates that he has not written before because **Cal Mohr** has done so well for him (and many others). Bob and Cal were schoolmates as early as grade school and they both took Course X at M.I.T. Bob now wants to scoop Cal by announcing that he has two more grandchildren, one born in Canandaigua, N.Y., to one daughter; and the other born in Rochester, Minn., to his youngest daughter. Bob's son Bill and his wife, who live in Ontario, Calif., have a son who was born last year. Bob is winding up his 18th year at Pfaudler, a division of Ritter-Pfaudler Corporation, where he has spent most of his time in the marketing

end of products and processing equipment. At present, his job is in Commercial Development. He is a 25-year Rotary man in Pittsford, N.Y., and is past President of that chapter. He has been on the Board of the Rotary Handicapped Children's Camp for Monroe County for many years. He is an Elder of the Brick Presbyterian Church, is semi-active in local and national A.I.Ch.E. and is past President of the Rochester M.I.T. Club. His wife Verna is active in the Cerebral Palsy Association as well as in various church groups. Bob's hobbies are restoring antique furniture, travel and bowling.

I wrote to all Florida classmates asking that they consider attending the M.I.T. Festival in Orlando which was held on January 27. **John Cashman** replied that he is now retired (Naval Captain) and working as Chief of the Engineering Division, Eastern Test Range. . . . I have also written to some '33 girls, all Course IV, asking that they consider attending the Reunion. **Margaret Kelly Geddes** wrote to say that in 1933 Course IV was in Rogers, Boylston Street, and none of the girls knew anyone else at the Institute. Margaret married a Columbia, '32, graduate, also an architect, Peter Geddes. She is a registered architect in Rhode Island and practiced there before becoming involved in City Planning. She is a member of the A.I.A. and is an Affiliate in the American Institute of Planners. Margaret and her husband enjoy sailing and Peter has now gone into race committee work.

I recently made a trip from Florida to Denver and was able to make a short stop-over in St. Louis where I had a chance to see **Elmer Henderson** and **Elis Litmann** who were thoughtful enough to come to the airport to meet me. We had a wonderful time talking for a few hours. . . . I phoned **Al Payne** but he was not at home. Al was with the Cottrell Company of Westerly, R.I., from 1933 to 1939 when he went to work for Monsanto. He was in the Plastics Division in Springfield, Mass., for 26 years, and is now engaged in long-range planning of plant sites and utility services for two of Monsanto's four domestic operations as well as for a number of their International Division plants. The Paynes will celebrate their 30th wedding anniversary in February. . . . In Denver I talked by phone with **Fred Walker**. He is with the Earth Dam Section of the U.S. Bureau of Reclamation. . . . We have two address changes this month: **Dave Smith, IV**, and **Mal Fleming, XIV**; addresses on request. . . . Remember, only two months until our 35th Reunion.—**Warren J. Henderson**, Drawer H, Fort Rock Farm, Exeter, N.H. 03833

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Last fall *Materials Research Standards* magazine had an article about **Paul A. Archibald** who received an Award of Merit from the American Society for Testing Materials. He was cited for distinguished administrative and technical

service to the A.S.T.M., particularly for his outstanding contributions to and leadership of the Committee on Steel. After graduating with our class, he attended the Colorado School of Mines. In 1935 he started his career with U.S. Steel and two years later joined the Denver and Rio Grande Railroad. In 1941 he became a research metallurgist with Baldwin-Lima-Hamilton Corporation, and in 1949 became the Chief Metallurgist of the Standard Steel Division located at Burnham, Pa. Paul is the official Society Representative of his company and has been active in A.S.T.M. affairs for 18 years as a member and chairman of various subcommittees of the Committees on Steel and on Related Alloys. He served on the Society's Board of Directors from 1958 to 1961. In addition to attending meetings of various related professional societies of which he is a member, he has written many technical articles. . . . Word from **Arthur J. Manson** tells of his son Arthur's marriage to Miss Kay Midkiff on February 3 at Gonzales, Texas, where Art and the bride's family make their home.

The Brockton, Mass., *Enterprise and Times* carried the following story on a VI-A class member: "**George E. Fickett**, Vice President of American Design and Development Corporation of Whitman, has been elected Vice President of the Smaller Business Association of New England. Fickett was elected to the post by the association's Board of Directors at their annual conference and meeting at the Somerset Hotel in Boston. A native of Augusta, Maine, Fickett was graduated with bachelor's and master's degrees in electrical engineering from the Massachusetts Institute of Technology in 1934. He has held management positions with a number of large firms over the years including Minneapolis Honeywell, the Bridges-Wilson Corporation and the Powers Regulator Company of Skokie, Ill. In addition to his duties at A.D. and E., Fickett is also a Director of two companies in Holly, Mich., the Clark B. Schneible Company and the McDaniel Tank Manufacturing Company. He was also recently elected to the Board of Directors of the Harris Refrigeration Sales and Service Company, Inc., of Cambridge. He is married, the father of two children and resides on Shoot Flying Hill Road, Centerville. As a Vice President of S.B.A.N.E., he will help coordinate and oversee the legisla-

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tive and educational activities for the more than 600 member companies throughout the six-state area." . . . **Dave Tashjian** writes that he is currently Assistant Program Manager for N.A.S.A. A.G.E.N.A. Programs at Lockheed Missiles and Space Company in Sunnyvale, Calif. . . . **Ted Steinberg** is a practicing ophthalmologist in Fresno, Calif., and was recently elected President of the Fresno County Medical Society—**George C. Bull**, Assistant Secretary, Mid-Atlantic, 4961 Allan Road, Washington, D.C. 20016; **James Eder**, Secretary, 1 Lockwood Road, Riverside, Conn.; **Norman B. Krim**, Secretary, 15 Fox Lane, Newton, Mass.; **W. Olmstead Wright**, Secretary, 1003 Howard Street, Wheaton, Ill. 60187

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All the material for this month's notes comes from those two indefatigable correspondents, **Ham Dow** and **Allan Mowatt**. From Ham we have the following, extracted from holiday greetings: "**Al Fletcher** writes that he is now busy working on a power plant in Virginia and is enjoying his new association with Stone and Webster, having left the Electric Boat Company, Quincy Division. Al reports that his son, Dick, has been accepted in the M.I.T. Class of 1972. . . . **Willie Dunn's** wife, Elsie, reports that all their children are now away from home and she has invited Edith and me to stay with them when we visit Honolulu. One of their daughters is teaching in nearby Palo Alto. . . . Finally, in response to my congratulations on his promotion to the position of Division General Manager for General Electric, **Ed Woll** notes this formula for success, 'I enjoy the work and am having a lot of fun at it.' I noted, without the benefit of research, that I believe Ed is the highest ranking manager with G.E. from M.I.T. since Alfred P. Sloan; he is currently the highest ranking classmate."

Allan's letter reads: "**Bill Barker** works for the Oxford Paper Company in Rumford, Maine. He has recently been put into Product Applications on specialty papers so is doing quite a little traveling to prospects and customers to learn their problems and feed the information back to his development people. So far his itinerary has included upper New York State, New York City and Chicago. He told me he expected to be traveling farther west in the near future. He said he and Mae had remained healthy this winter and they had been invited to join a curling club in Belfast but the 100 miles each way prevented their going. He is looking forward to the next Class Golf Tournament this summer as he expects, with his traveling requirements, he would be able to play more of his matches in person. . . . **Gerry Rich** is busy getting Rich Laboratories, Inc., off the ground. Verna is acting as his one-girl office manager and secretary. Rich Laboratories recently bought some heat sinks from us (Astrodyne) so I wanted to see how they worked out. They are being

used in an inverter for cable T.V. Gerry designed the unit for emergency use in cases of commercial power failures—nationwide there could be a substantial market. He told me he had been putting in 70-hour weeks so has had no time for golf, even though their home overlooks the fairways. His new micro-miniature relay is coming along and is reaching the market research stage. . . . **Bob Forester** has been active in Alumni Council work and is also busy with advance planning for our 35th Reunion. He will be attending an Officers' Lunch later this month to help organize a meeting of the Boston Area '35ers. . . . **Ned Collins** is working on a building project for the Boston City Hospital.

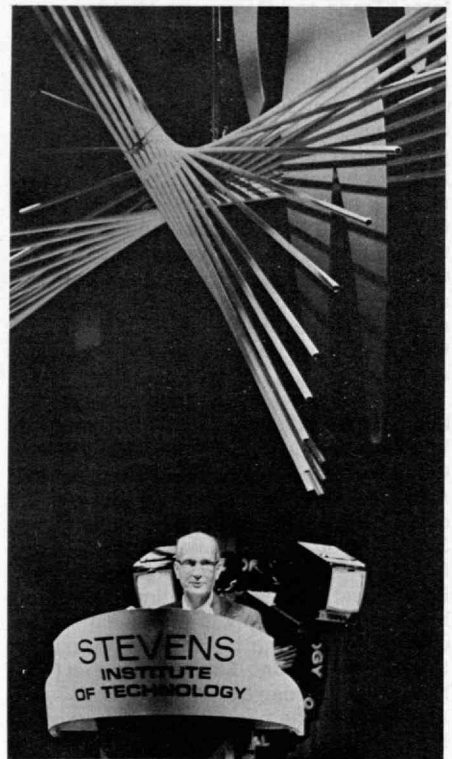
"**Bob Anderson** is spending a great deal of his time getting Filene's new facility completed in Burlington. . . . Last week I flew down to Houston to see my mother, age 82, who is seriously ill in The Heights Hospital there. She has been spending her winters with my sister in Houston and her summers at her home in Sandwich, N.H. Prior to that, I spent a week in the Southern New Jersey, Eastern Pennsylvania area travelling with our sales representatives. I had good intentions of contacting some of our classmates in the area but time never permitted. Astrodyne has been doing fairly well with 1967 sales up 22 per cent over 1966 and 1966 was 55 per cent over 1965. We still have only a fraction of the total market in heat sinks and rate ourselves number two in the industry—so we try harder! My activities are expanding on other fronts too; I was elected Junior Warden of our local Episcopal Church in Newtonville where my two sons (now 12) and I sing in the choir. I have been re-elected to the Board of Directors of the Weston Golf Club and will be Chairman of the Golf Committee for the second year. In my 'extra' time I have been helping two friends get new businesses started and have been invited to join the Board of Directors of each. On the home front I have so far tackled successfully every repair and modernization project that my wife and I could think up—and there is plenty of opportunity in a 65 year old house. So far these have included built-in closets, plumbing and electrical repairs, new ceilings, wall papering, painting, re-finishing furniture and all. . . . **Al Johnson**, whom I had not seen since November, when we, with our wives, had dinner together in Palm Springs, Calif., tells me he is leaving late this month on an 18-day vacation with his wife to Waterford Island off St. Thomas in the Virgin Islands. Most of the time he is extremely busy at Arthur D. Little Company."—**Phoenix N. Dangel**, Co-Secretary, 329 Park Street, West Roxbury, Mass. 02132; **Irving S. Banquer**, Co-Secretary, 20 Gordon Road, Waban, Mass. 02168

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Changes of address reported by the Alumni Office are frequently indicative of

news. **Jack Austin** writes from Mercer Island, Wash.: "We moved out here early last September and we're thoroughly enjoying living in this beautiful part of the country. And for sailing you just can't beat the Puget Sound area. . . . I came out here as a marketing 'expert' for a large realty holding and development company, and soon found myself up to my ears as President of one of our subsidiary companies. Object: turn loss into profit. So far, a lot of hard work—but fun." . . . **Hal Miller** writes from Hollywood, Fla.: "My permanent address is still Scarsdale. The Hollywood location is a wintertime address. About the only thing I can report is that I was Special Gifts Chairman for the New York area for the Fund for our Class." Guess what? The gifts hit 210 per cent of the budget! . . . **Eli Grossman** has moved to Highland Park, Ill., from Barrington, R.I. He joined the Presidential Life Insurance Company as Executive Vice President on February 1. . . . **Semon Knudsen** has changed his business address from General Motors (Executive Vice President) to Ford (President). The *New York Times*, on February 7, referred to him in a headline as a "cool driver in a dramatic U turn."

In Davenport, Iowa, in January I happened to run into Dorothy and **Lee**



The ethics and morality of genetic research must be founded on a "reverence for emotional memory capacity in neurological systems," William B. Shockley, Ph.D.'36, Professor of Engineering Science at Stanford University, told a major convocation of Stevens Institute of Technology this winter. The standard we must use in our control of human heredity, he said, is the subject's ability to remember emotional experiences. To abort the life of a plant, for example, "does not distress me because it has no neurological system to record the agonizing experience of imminent destruction. Thus, the abortion of a foetus whose neurological system is not functioning is less offensive to me than the trapping of a mouse that dies slowly and records that death in its memory." (Photo: Stevens Indicator)

Tolman. Lee is concerned with quality assurance at the Rock Island Arsenal and Dorothy is teaching in a difficult elementary school. One daughter is married and the other in business school. . . . As I perused the report of the President (Howard not Lyndon) for 1967 I found that **Elmer Davis** had been promoted to Assistant Director of the National Magnet Laboratory at the Institute. . . . An end of the year newsletter from **Hank Lippitt** and Ruth reports that they are continuing to travel extensively for both business and pleasure. Hank's concerns as Legal Counsel for the California Gas Producers keep him hopping. . . . By the time you read this your Secretary will have returned from a month's business and pleasure trip across country and she will be most anxious to have your news.—**Alice H. Kimball**, Secretary, 20 Everett Avenue, Winchester, Mass. 01890

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Ray McFee has been named an Associate Director of the Douglas Aircraft Company's Advanced Research Laboratories, Santa Monica, Calif. Ray joined Douglas after serving, for the last three years, as Manager of Jet Propulsion Laboratory's Lunar and Planetary Services section, Pasadena, Calif. His nearly 30 years of scientific research includes such positions as Director of Research at Aerojet-General Corporation's von Karman Center, Director of Research at Aerojet's Astrionics Division and Director of Research at the Electronics Corporation of America. . . . **Bob Wylie** is Manager, Technical Engineering Services, in the Commercial Engineering Department of Sylvania Electric Products, Inc., Danvers, Mass. Throughout his years as an illuminating engineer (some 27 years) he has been credited with numerous "firsts" in lighting development and equipment design. . . . **Charles Blessing** is serving on the Honors Awards jury for the Minnesota Society of Architects, selecting those projects which will be honored during the convention of the Society. Charlie is also Director of the Detroit City Planning Commission. . . . **August H. Schilling** is President of the Leslie Salt Company. He is also a Director of the Leslie Salt Company and Vice President of the Schilling Estate Company, which is the largest stockholder of Leslie Salt.

John J. Hanlon is a Trustee of the Textile Research Institute. John began his career in the textile industry when he joined Mohawk Carpet Mills in 1939 as a color technologist. He has held several positions at Mohawk and its corporate successor Mohasco Industries, Inc. He has been in charge of the Color Measurements Laboratory, the Production Dyeing Departments and the Technical Department. John is presently Manager of the Technical Research and Service Department of the Research and Development Division at Mohasco Industries. He is the author of several papers on color measurement and

carpet technology. . . . **George Buckle** is involved in technical review and analysis of work produced by scientists in the Space Sciences Labs., at Marshall Space Flight Centre in Huntsville, Ala. . . . **Dave Tuttle** writes that he "visited the Institute in the summer of 1967 for the first time in a long while, to take the special E.E. course in direct-access, real-time computer usage in electric network analysis." He expects to be on sabbatical leave in France (Marseille) in 1968-69. Dave is still very busy in normal life as Professor of E.E. at Stanford University.—**Robert H. Thorson**, Secretary, 506 Riverside Avenue, Medford, Mass. 02155; Professor **Curt Powell**, Assistant Secretary, Room 5-325, M.I.T., Cambridge, Mass., 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

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30th Reunion; Chatham Bars Inn; June 7-10, 1968; for reservations: Armand L. Bruneau, 150 Broadway, New York, N.Y.

Assistant Secretary **Ira Lohman**, canvassing the West Coast for someone to contest **Hal Strauss'** reputation as a correspondent, submits a report from **Sam Steere**: "Sorry about the delay in the forwarding of your letter. We like it here in Tacoma, Wash., and bought a house almost two years ago. Just a few days ago I became Col. S. A. Steere, Jr., U.S.A.F. Ret., but for the past 1½ years have been going to Pacific Lutheran University at night, working on an M.B.A. My class work is now completed and I hope to hand in the thesis by April 15 and graduate on June 2 (How about that!). Since I plan to teach at the college level, I have applied for and been accepted by the University of Washington Graduate School of Business—to work for a D.B.A. starting about July 1. I figure it will take 1½ to two years, during which I plan to commute from Tacoma. My objective is to teach in a Pacific northwest university. I have one grandson, Robby; his father Sam, 3d, is an Army Lieutenant in Thailand. David, the next oldest, is in college, while Betsy, almost 16, and Pete, 13, are with us. My wife Edith got the scholastic bug a while back, and returned to finish her degree—getting a B.A. in art at the University of Puget Sound last August. She is now well started toward a master's in art history. She has enjoyed her scholastic work as much as I have. For those who remember me as of yore—don't knock it. I have a straight A average—merely proving that motivation is sometimes more important than mental agility. And motivation does come with the kind of challenges and experiences I found in the Air Force (which also runs a tough engineering school!), with the stimulus of 6½ years in the Far East and more years in Europe, and a real taste of responsibility. Sorry about the handwriting; my secretary and electric typewriter have been inherited by my suc-

cessor. It's a good life, though, and if I can't fly jet aircraft any more, I still have my XKE coupe—which is the next best thing to flying (unless you have a Ferrari or a Maserati). Can't make 1968, but maybe 1973!"

Doc Wochos (his letterhead is inscribed—President, I.T.T. Cannon Electric) writes: "Thanks, Ira, for your letter. If I were more faithful in my attendance of the M.I.T. Southern California meetings I could be more helpful to you on attendance for the 30th Reunion. I'm sure you've seen the excellent program arranged by **Lou Bruneau's** Reunion Committee. Lou has always been a real motivator for the class reunions, and I'm certainly looking forward to seeing him there. Sorry I can't be more helpful, but from here on I promise to jot down notes about our classmates as I run across them!" (Ed. Note: How about every one of you doing the same thing!). . . . **Rafael Sanchez y Casanova** reports: "I lost 18 years of work in Cuba, when the Lone Star Cement Corporation was confiscated. After a short stay in Puerto Rico, I became Plant Superintendent of Cementos Mexicanos in Monterrey, Mexico, and stayed for nearly six years. Now I am practically starting anew in the Vernon Division of Bechtel Corporation in Los Angeles. And that's a long path, Ira, from the time we spent together as thesis partners!". . . **Ira Lohman** himself has provided the following account: "We are just beginning our fifth year here in California and like the West very much. We live in Saratoga, a suburb of San Jose, approximately 60 miles southeast of San Francisco. We have our 12 year old daughter Dale at home, but the rest of our children have left and it's been mighty quiet around our house this year. Our oldest daughter Linda is married and living in Palo Alto while her husband is getting his M.B.A. at Stanford. Number two daughter Judy is a student at Christian College in Columbia, Mo. Our son Guy is a freshman at Pomona College at Claremont, Calif."

"Last October Louise and I took a two-week trip through the high desert country of the Southwest and ended up in New Orleans. We spent an enjoyable evening with **Adam Gambel** and Jane. Adam is President of a company that makes sugar syrups and flavorings for soft drinks and foods. He seems as young and ebullient as he did in school, and it was great seeing him and his charming wife! We see **Don Weir** and Betts occasionally on trips to the Los Angeles area. Don is President of California Camera and lives in Beverly Hills. We are looking forward to a visit with them this weekend when they stop in Saratoga enroute to Berkeley to visit their daughter Donna, who is a student at the University of California. My job here as Manager of I.B.M.'s West Coast Product Development Laboratory keeps me quite busy but is very interesting. Our principal products are disk storage devices which are made in our Manufacturing Plant on the same site

as the Laboratory. I.B.M. also has a branch of its Research Laboratory, a Card Plant, two Advanced Development Laboratories and an Education Center as well as sales and service organizations in the area so we have plenty of related company activities nearby. Sorry that Louise and I will be unable to make the 30th Reunion at Chatham. The plans for this affair sound excellent and we would certainly be attending if we lived closer. We will definitely plan on attending the 50th if we're still around. We hope it will be as well attended as the 30th!"

Other correspondents this month include **John Sullivan**, who observes: "Last February I went to India with the Director of the Dayton Art Institute, carrying out my responsibilities as President of the Board. After 10 years I retired from this position in June. I am associated with Ed D. Stone, a New York City architect, on a new community college in downtown Dayton. Our daughter, Frances Law, will be graduated from Wells College this June." . . . **Bruce Old**, discussing life at A. D. Little, reports: "I recently won the Metropolitan Life Honor Award of the National Safety Council for a report entitled 'State of the Art of Traffic Safety.' Also I was a member of a six-man U.S. team sent by the President to the Republic of China to study their science and technology base and its relation to economic growth. Our group included Dr. James B. Fisk, Ph.D.'31 (President of Bell Telephone Labs), and Dr. Donald F. Hornig, Special Assistant for Science and Technology to President Lyndon B. Johnson." . . . **Andy Stergion** and Betty described to us what the holidays are like in Corning: "Around here the house seems quite empty with only Keith and Beverly at home. But on the 15th Peter gets home from Yale and on the 20th Betsy returns from Ithaca. Then sometime during that week Diane will arrive with her husband Bob and little Susanne. Our two youngest will be out of school on the 21st, and then we'll be on our way to Florida to catch the plane for the Bahamas for a week's visit. How we are looking forward to once more experiencing the beauty of a tropical Christmas! Keith has started wrestling, and what a battle he is always having with food. These kids just have to keep their weight down, and you well know that 15 year-old boys never feel full!"

I had counted on **Ed Hadley** for a little personal news last month—although there is no knocking the tremendous news of others he did submit, but it was so lengthy I saved for now his own blank verse. The *Review* can't afford to parse it as Ed did, and it loses in the transliteration—but then Ed never hesitated to do as much in *Voo Doo!* "This year we hoped to do like last, And greet you two months late, But postal rates are going up, We can't procrastinate, At least as long—so here we go, For Nineteen Sixty Eight./The year just past has been quite full, Of glorious happenings, Our silver wedding, trip

abroad, More international things, Our eldest's visit, sub-school leaves, And Sue's engagement ring./In March we quietly prepared, For dinner and a play, When suddenly there did appear, A cake and a display, Of silver gifts from all the fruits, Of that first wedding day./In May and June the youngest four, Accompanied Ed and Jean, To visit friends from Norway south, To where the tower did lean, And Britain during natal days—Our Beth and Beth the Queen./ We saw museums, churches—lived, In castles on the Rhine, Climbed mer de Glace and Matterhorn, And sampled all the wine, Boats on the Seine, the sewers too, Swims in North Sea brine./And then the world did come to us, Two Dutch (American Host), Then Rajan came, through A.F.S., To India we toast, And Sue has brought Bill Sargeant in, From far Lake Erie's coast./Ed is now on Sentinel, and George on S.S.T., With Dick en route to Pearl and Guam, Sue physical therapy, John in Lehigh, Still at home, Are P., D., M., and B./And so it is, with brimming hearts, We wish a year of joy, Good luck, accomplishments to you—Man, woman, girl, and boy!"

Bruce Leslie says: "Miss seeing you since Carolyn graduated—but we're looking forward to Reunion in June. Thomas Webster Leslie was born August 16. It's fun being grandparents!" . . . **Dave Acker** and Marion have also reported a busy year: "This year we recall a family reunion to commemorate Gramp Bacheider's 75th birthday, but for convenience the gathering was held on Father's Day. With the help of many members of the family, we were able to prepare a brief history, 'The Bacheider Family,' covering 14 generations of the family. Travel has been a feature of the year. Business took Dave to Nigeria in April, with a return via numerous cities in Europe. Another trip in July included Brussels and southern France. Beautiful fireworks in Cannes on the evening of July 14 represented Bastille Day to the French, but to Dave were a reminder that the day was Marion's birthday! Late September brought a trip to rainy Mexico City. But all the traveling was not alone. A business trip early in August gave two of us the opportunity to visit with Merrillie and Harry, and to see their new home in Santa Monica. Soon thereafter, Cindy, Marion and Dave left by car for Michigan to retrieve Glenn, who had spent eight weeks in Interlochen at the National Music Camp. The return trip consisted of a series of college visits to acquaint our high school senior with what can lie ahead for him. Glenn qualified for the All-State band in January and placed 8th chair in the first clarinets. He is now Concert Master of the high-school band and has been elected its President. Cindy continues to progress nicely with her flute and, like her mother, is still active in Girl Scouts. Marion this fall even took on a new activity—rug hooking. Late in May Grandma Acker finally consented to come live with us. Although she continually hoped to regain sufficient strength to return to her own home, she

gradually weakened. But she did live long enough to become a great-grandmother. Tina Lynn, the new member of the Acker family, arrived October 9 and is happy with her parents Karl and Jeanne at the home they acquired in East Meadow, N.Y., early this year. Merrillie and Harry are eagerly awaiting their addition to the family tree at the end of the year." . . . How is it with you? Is there enough fun in your life? Do you need any urging to send in your reservation for Reunion 30? Has **Norm Leventhal** heard from you? As a special inducement, your Secretary offers to discuss a minimum of 5 minutes of business at Chatham on June 7-9 or at Cambridge on June 10—with any of you who need additional justification! Today, put a big red X on each of the four days—and live a little.—**Frederick J. Kolb, Jr.**, 211 Oakridge Drive, Rochester, N.Y. 14617

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Henry Knippenberg has joined Premier Industrial Corporation, Cleveland, as Vice President, working closely with the firm's Akron Brass division of Wooster, Ohio. Henry was previously Director of Corporate Planning for Automatic Sprinkler. . . . **Kenneth L. Cook** has been elected Vice President of the Society of Exploration Geophysics, for the 1967-68 period. Ken recently presented papers at the two-week meeting of the International Union of Geodesy and Geophysics held in Zurich. . . . Omark Industries, Inc., Portland, Ore., has named **Edward P. Skralisks** as President, overseeing day-to-day problems. Ed came to Omark in 1954 as Assistant to the President. Omark makes cutting and fastening equipment. . . . **William S. Brewster**, President of United Shoe Machinery Corporation, authored a fine article in the December, 1967, issue of *Industry*, the publication of Associated Industries of Massachusetts. Bill's article, "Labor Saving Equipment and the Future," had been edited from his presentation at the 43d Annual New England Conference in November.

Donald B. Broughton of Universal Oil Products Company, Des Plaines, Ill., was presented the Alpha Chi Sigma Award of the American Institute of Chemical Engineers at the annual meeting in November. Don is Coordinator of Engineering Research at U.O.P., engaged in the development of the Udex, Sulfolane and Molex processes. . . . **Mike Herasimchuk's** sharp eyes picked out a clipping from the *Oil and Gas Journal* reporting that **Harold J. Muckley** has been elected President of Houston Contracting Company. . . . **F. A. L. Holloway**, President of Esso Research and Engineering Company, recently addressed the annual meeting of the A.C.S. Corporation Associates, dealing with the industry-academic interface. The A.C.S. Corporation Associates is to become the major channel of communication between industry and the American Chemical Society.

Arthur R. Olson, Research Manager at Kendal Company in Walpole, Mass. wrote that his two sons were both married last summer. One graduated from Bowdoin in '65 and is now an F.D.I.C. bank examiner. The younger son graduated from West Point in '67 and was stationed in Okinawa. Art's oldest daughter is a pre-med student at Holyoke, and the youngest girl is a sophomore in high school. . . . **Ernest O. Ohsol** wrote that he joined American Cyanamid Company last Fall as Director of the Stamford Engineering Department, following a brief assignment at Escambia Chemical, in Wilton, Conn. He's involved in some highly sophisticated projects covering a wide range of technology. . . . **Joseph C. Zeilen** wrote that he is Professor of Soil Engineering at Technion and is Dean of Civil Engineering. Also, since 1965, he has been Vice President for Asia of the International Society of Soil Mechanics and Foundation Engineering, and has just finished hosting the Third Asian Regional Conference in Haifa. Joe is planning for a sabbatical leave in 1968-69. . . . **Roger W. Swartz**, 5916 Wilmet Road, Bethesda, Md., wrote: "Thanks for the *Technology Review*; a consistently fine job!" . . . **Meredith C. Wardle**, living in Chadds Ford, Pa., has been, for the past ten years, Manager of Research at All American Engineering Company, in Wilmington, Del. His firm does R. and D. for aircraft arresting and catapult gear and aerial recovery operations. Kip also does work for the Post Office Department in personal restraint for vehicles. He also wrote that he survived a crash landing recently in his own 1940 Culver Cadet airplane—a crank shaft failed. . . . **Mrs. Ruth Berman Pitt** (Mrs. Burnett M. Pitt) wrote that this year she is teaching Biology and Chemistry at Newton South High School; for the past 16 years she has been in education at the college and junior college level. Ruth wrote that her daughter Susan graduated last June from M.I.T. in Biology, and believes she was the first woman graduate to have both parents as M.I.T. graduates. (Burnie was '42; he died in 1964.) Ruth is on the Alumni Council, and also on the Executive Board of the Association of M.I.T. Alumni.—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

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As the result of an inadvertent error in Class Notes, I received a letter from **Andy Stokes**, X. If errors are responsible for receiving news, we will try to put more errors in subsequent columns! Andy writes: "In the October/November issue of the *Review* my position was reported as General Manager of Research and Development. It is, since 1963 and 1965 respectively, Vice President for Technology and Planning and Director of Columbian Carbon Company, a wholly owned subsidiary of Cities Service. We are a diversified petrochemical and pigment company with operations in Germany, U.K., Italy, Holland, Philippines, Brazil, Puerto Rico, Canada, Mexico,



At a recent award ceremony held in Washington, D.C., the Deputy Administrator of the National Aeronautics and Space Administration presented W. Hewitt Phillips, '39, with a citation for

"Exceptional Scientific Achievement." Shown seated (center) is James E. Webb, N.A.S.A. Administrator.

Japan and some 10 or 15 states of the U.S. Much more importantly, I have a son, Jeffrey Stokes, who is a senior in physics at M.I.T. Hary Stokes is a sophomore at Duke and Chris Stokes will be a freshman this coming fall, probably at Ohio State. We sail and race on Barnegat Bay having just sold our Sailmaster 22 'Condy' to acquire a Morgan 34, the Pinãta, appropriately named for being 'broken open' by us Christmas Day, 1967. We hope to have many M.I.T. friends cruise with us this summer in the Newport—Elizabeth Islands area. With best wishes and my compliments for the good job you are doing as Secretary." . . . **Charles Epstein**, II, has exchanged the more rigid climate of Westfield, Mass., for the year round mild climate of Southern California.

Paul Bollerman, XIX, advises: "In addition to activities connected with building a new plant for my company, The Pyrometer Instrument Company, Inc., at Northvale, N.J., I have recently been elected Mayor of Tenafly, N.J., so look forward to a busy year." . . . From **Abraham Rockwood**, I, comes the note that he is still a design engineer with Maurice A. Reidy Engineers in Boston and occasionally sees Walter Caron who is Chief Engineer at Gonteaume and McMullin. . . . If you want to know why the sea is blue or green, the answer is in an article entitled "The Blue Sea" in *The Physics Teacher*, November, 1967. The author is **John Tyler**, IX-A, who, since 1952, has been with the Scripps Institution of Oceanography which is a graduate school of the University of California. . . . Recent address changes are: N. Bruce Duffett, 110 Wildwood

Drive, Marietta, Ohio; Jorge Echarte, 2621 N.E. 46th Street, Ft. Lauderdale, Fla.; Joseph H. Greenberg, 6833 N. Kedzie, Chicago, Ill.; Ernest T. Gregory, Jr., 165 Via Serena, Alamo, Calif.; Dr. Joseph D. Havens, 112 Hazelville Road, London N 19, England; Hrant Isbenjian, 264 Glenbrook Road, Stamford, Conn.; William S. Kather, 1445 N. State Parkway, Apt. 16F, Chicago, Ill.; Herbert B. King, 2315 Divisadero Street, San Francisco, Calif.; Mrs. Albert F. Norris (nee Eleanor A. Miller), 53 River Street, Norwell, Maine 02061; Dino Olivetti, 88 Abbot Street, Andover, Maine 01810; Frederick J. Port, Jr., Box 6266, Cleveland, Ohio; John B. Scalzi, Gateway Towers, Apt. 15F, Gateway Center, Pittsburgh, Pa.; Charles Smith, Jr., Department of Physics, University of N.C., Chapel Hill, N.C.; Robert W. Stewart, Box 456, Salem, Mo. 65560.—**Alvin Gutttag**, Secretary, Cushman, Darby and Cushman, American Security Building, Washington, D. C. 20005

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The fine news reporting cooperation of Paul M. Robinson, Secretary of Class '44, is gratefully acknowledged in informing us that **Robert Wilson Blake** (the Washington, D.C. Blake) has, for the 12th successive year, been the prime mover of a Christmas luncheon for students and alumni in the Washington, D.C., area during the year-end holidays. Bob started the series in December, 1956, the first year in which he was President of the Washington, D.C., Club. . . . **Johan Anderson** and his ever expanding Duplicon Company, of which he is

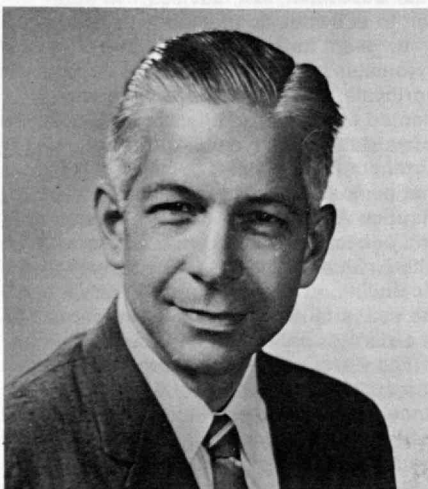
President, were subjects of a long feature article in a recent issue of the Worcester *Sunday Telegram*. Of particular interest since our last report on Johan and Duplicon concerned the addition of a branch plant in Greensboro, N.C., and the addition of a completely air conditioned toolmaking department in the Westboro plant which Johan characterizes as "the best toolmaking shop in New England." The company was founded by John and his brother 22 years ago in a barn in Hopkinton. He is proud of its proven stability, as evidenced by no employee layoffs for the past 10 years. He believes that its growth is due, in part at least, to its profit sharing plan which now boasts a fund of about \$396,000, representing about one third of company profits during its existence. It is interesting to note that Johan's philosophy is that there are four areas of importance in a man's life, and the job doesn't come first. "First, a man should develop himself, express himself to his own full potential. Second, comes his family and his obligation to them. Third, his religion, whatever that may be. Last comes the job. But if a man does his job to the best of his ability, it's amazing how much that does to the other three." Apparently his customers like the way his employees do their jobs for Duplicon has grown from a two man shop in a barn, to a modern establishment with 200 employees.

Harry H. Wasserman has been named Chairman of the Organic Chemistry Division of the American Chemical Society. Harry is associated with the Sterling Chemistry Laboratory, Yale University. After receiving his B.S. in 1941 he received his M.S. in 1942 and Ph.D. in 1949 from Harvard University. From 1943-45 he served as a Chemical Officer in the Air Transport Command. He was an Instructor at Yale in 1948, and Assistant Professor, 1957-62. He became a Professor in 1962 and was Chairman of the Chemistry Department from 1962-65. He was a Guggenheim fellow, University of California, Berkeley, 1959-60, and was a member of the N.I.H. Medicinal Chemistry Panel Study Section, 1962-66, and the N.S.F. Postdoctoral Fellowship Evaluation Committee, 1962-64. Currently he is American Editor of *Tetrahedron and Tetrahedron Letters*, and on the Advisory Board of A.C.S. Monograph Series. . . . **Alan A. Smith** is the author of a series of two articles entitled "Technology And Your New Products" appearing in the November and December, 1967, issues of *New England Business*. The articles comprise a condensation of a booklet carrying the same title and edited by Alan for the Small Business Administration. He is currently Director of Sales Promotion for Arthur D. Little, Inc., Cambridge, Mass. He joined A.D.L. in 1950, taking over Direction of Consulting Service to Investors. In 1963 he assumed direction of A.D.L.'s work on technology transfer for N.A.S.A.'s Office of Technology Utilization, which was reported to O.T.U. in January, 1965. He is editor of the *A.D.L. Industrial Bulletin*.

Robert Sinsheimer of Caltech is reported to have collaborated with two other associates in the successful creation of the complex D.N.A. molecule—and therefore life itself—in a test tube. Bob is a Professor of Biophysics at the California Institute of Technology, Pasadena, Calif. . . . **Fred F. Flowers** was recently elected President of D.I.F.C.O., Inc., manufacturer of mine cars and locomotives for open pit and underground mines. . . . **Robert E. Bailey** has moved as of May, 1967, to the International Business Machines' Federal Systems Division where he is an Advisory Systems Analyst for meteorological systems. . . . **Theodore H. Guething** has been elected Vice Chairman, Board of Trustees, Mackinac College, Mackinac Island, Mich. . . . Those wishing to attend the 20th Annual M.I.T. Fiesta in Mexico, Mexico City, March 14-16, 1968, may make arrangements with the M.I.T. Club of Mexico City, Reforma 116-804, Mexico 6, D.F., Mexico.—**Walter J. Kreske**, Secretary, 53 State Street, Boston, Mass.; **Everett R. Ackerson**, Assistant Secretary, 16 Vernon Street, South Braintree, Mass.; **Michael Driscoll**, Assistant Secretary, 63 Center Street, Nantucket, Mass.

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Leon Rubin has been named Manager of Polaroid's Central Analytical Laboratory at Cambridge. . . . A note from **George Toumanoff** tells that he is Director of Corporate Planning for Cutler-Hammer. George's daughter Sue graduated from Bennington last June. Reporting on his sailing, he writes: "Bought a Canadian Shark—24 cruising/racing sloop and won first overnight race last summer, (Several I didn't win were also fun)." . . . **Frank Staszkesky**, Executive Vice-President of Boston Edison Company, has been elected a Director of the Company. . . . A P.R. release from Abex Corporation announces the appointment of **Bob Ely** as Assistant to the Vice President, Engineering. Bob joined Abex at Mahwah, N.J., in 1945 and has been identified with the Railroad Products Group most recently as Manager of



John W. Sheetz, '42

Contract Research and Development. . . . Got many newsclips and announcements of **Jack Sheetz's** selection as Vice President of Tufts. Jack is leaving his post as Director of Resources at Harvard Business School as of January 15. His new duties at Tufts will include fund raising, alumni activities, publications, public relations and community relations. You will recall that he was Executive Director of the M.I.T. Second Century Fund which produced \$98,000,000; the largest fund raising venture of any institution of higher learning up to that time. We wish Jack the very best of success in his new position. . . . One obit this month, **George Richardson**, who got his B.S. at Brown and took the Meteorology Course with our Class, passed away at Corning, N.Y. George was a Designer of Specialized Products for Corning Glass Works. He studied architecture at the Rhode School of Design and was a nationally known sculptor. We extend sympathy to his family.—**Ken Rosett**, Class Secretary, 191 Albemarle Road, White Plains, N.Y. 10605

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25th Reunion; M.I.T. Campus, June 7-10, 1968; for reservations: Kenneth Warden, 10 Constitution Road, Lexington, Mass.

Bill Lacy wrote that our Class had the largest representation at the M.I.T. Florida Festival in Orlando on January 27. Present were Ken Wadleigh, Al Bakker, Bob Caldwell, George Slifer, Herb Sanderson and Bill Lacy. He wrote that none needed a wheelchair. I received a group picture of these gentlemen which will be published in the *25th Reunion Book*. . . . **Charles E. Burnham** was appointed as Director of Research and Engineering of the Draper Division of North American Rockwell Corporation in Hopedale, Mass. He has served in various research and engineering capacities with Draper since 1946. . . . **Jim Spitz**, who is President of Tenneco Chemicals, Inc., New York City, has been elected to the additional post of Senior Vice President of the parent firm, Tenneco, Inc. Jim began his chemical industry career in 1946 with Newport Industries, Inc., which in 1957 became the Newport Division of Heyden Newport Chemical Corporation (predecessor of Tenneco Chemicals). He became President of the division in 1961 and served collaterally as Vice President and Director of Heyden Newport until 1965, when he was named Group Vice President of Tenneco Chemicals. He was promoted to Executive Vice President in 1966 and was elected President in November, 1967.

Herb Sanderson of Orlando, Fla., represented M.I.T. at the Inauguration of Paul Francis Geren as the fifth President of Stetson University on January 26, 1968. . . . Over 250 biographies and photos have been received for the *Reunion Book*. The Committee is having frequent meetings and it appears

that this is going to be an outstanding four days in Cambridge. Remember the dates, June 7-10, 1968. There is plenty of time to make reservations for you and your family. We are keeping these class notes brief because there is a wealth of information in the *Reunion Book* which you will receive, if you have ordered it, on June 1.—**Richard M. Feingold**, Secretary, Ritter and Berman, 266 Pearl Street, Hartford, Conn. 06103

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Joseph E. Johnson, Jr., the third defendant in the Giles-Johnson rape case which began with an incident on July 20, 1961, in rural Montgomery County, Md., became a free man with all rights of citizenship restored on February 10, 1968, following a full pardon granted the previous day by Maryland Governor Spiro T. Agnew. Said Governor Agnew: "It was the only solution to the case." A week and a half earlier, on January 22 at a hearing in Annapolis, Judge Childs of the Anne Arundel Circuit Court had denied the petition for a new trial and sent a forlorn Johnson back to the Maryland State Penitentiary. I went to the hearing at Annapolis on January 22 and sat in the packed courtroom with **Harold A. Knapp, Jr.**, his wife, Barbara, and her sister, Harriet. The Giles brothers were there in the audience also. It was the first time that I have met Harold, although we have had several telephone conversations since last November. At the noon recess, prior to the reading of the court's opinion, Harold was pessimistic and disturbed. Judge Childs had indicated his displeasure with the U. S. Supreme Court for vacating, in the spring of 1967, the December, 1961, sentence of the Giles brothers which led to a new trial and freedom for them on October 30, 1967 (see *Technology Review*, January, 1967, pp. 116, 117). Harold had been widely acclaimed as a hero in the case for saving the State of Maryland from a grievous error. To the members of the Giles-Johnson Defense Committee he is the greatest investigator since Sherlock Holmes.

Were the Giles brothers innocent of the crime of rape or had they simply been set free on a technicality? Should Johnson, who was tried separately and whose case was not included in the Supreme Court edict, also be granted a new trial by analogy? The question before the court was not on the guilt or innocence of Johnson but only on whether or not he had received a fair trial in 1962. Following the noon recess, Judge Childs began to read the opinion which had obviously been prepared from material submitted weeks earlier and not from the arguments made that morning. Conclusion at the end of the opinion which required 30 minutes to read: Johnson had received a fair trial in 1962. Motion denied. There was no relief for Johnson from the court. He was still sentenced to life imprison-



Charles E. Burnham, '43 S. J. Spitz, '43

ment. Yet the Giles brothers were free and with no criminal record. Should Johnson apply to the governor for a pardon or wait in the penitentiary while his lawyer and the defense committee prepared another round of appeals perhaps all the way to the U.S. Supreme Court? The decision was Johnson's. He chose the pardon route. Ironically, the state's attorney, who would admit no wrong doing by the state in the original case, indicated he and his predecessor support a request for pardon. The Washington papers, which showed a smiling Johnson with his father on the front pages of the big Sunday editions, marked the celebrated case as ended.

Harold, however, has been looking beyond; he has been looking five years ahead to the time when they will all be purposeful, productive citizens. He no longer has that mortgage on his house which was required to get bail money for the Giles brothers last summer for the period between the Supreme Court ruling and the new trial. However, there is still the matter of a \$3,000,000 lawsuit brought against Harold by the parents of the complaining witness. As I said in the January Notes, people find it not a little surprising that Harold is not a lawyer but an M.I.T. educated physicist, mathematician and operations researcher who earns his bread advising generals and admirals on plans for multi-million dollar weapons systems. He became involved in the case as a private citizen writing a letter to the editor of the Montgomery County *Sentinel* in August, 1962. Harold wrote: "Every time it comes clearly to my attention that someone is to be executed . . . I go through a certain amount of anguish . . . It's a childish reaction, but anyhow I'm troubled." He then proceeded to compare the Giles case and the sentence imposed by Judge Pugh with another case in which it became the duty of a woman judge to impose sentence on a very brutal rapist. He compared her carefully reasoned sentence of life imprisonment instead of death with that of Judge Pugh's. Said Harold: "Judge Pugh's brief sentence of death for John and James Giles stands out in contrast."

The next month in September, 1962, Johnson was tried in Anne Arundel County after the court appointed defense attorney received a change in venue from Judge Pugh's bailiwick. Again, the jury accepted the prosecution's version of events rather than that of the defendants. And the two-judge panel imposed the death sentence for Johnson as Judge

Pugh had done nine months earlier in the trial of the Giles brothers. In December, 1962, Harold received holiday greetings from John Giles who had seen Harold's letter in the *Sentinel* while awaiting execution in the Maryland penitentiary. Meanwhile, Harold had read the transcript of the Johnson trial. He found what he considered to be revealing inconsistencies in the prosecution testimony between the Giles trial and the Johnson trial. While the Giles-Johnson Defense Committee gathered an avalanche of petitions to the governor for executive clemency, Harold continued his investigation. In the summer of 1963 he wrote a 150-page report, swore its contents were true and accurate to the best of his knowledge and belief, and shipped it off for the governor's clemency hearing. The report requested a full pardon for the three defendants. The basis for the request was the conclusion that the three defendants were not guilty. Said Harold in the report: "No one was more astonished than I to discover that the best explanation of events indicated that the crime for which the three defendants were sentenced to death did not occur; that when all the evidence and the previous police records of all the people involved are considered, there is more than reasonable doubt that the three young men committed rape."

Harold backed up his report with statements from the five jurors in the Giles brothers trial who read the report and were willing to comment. All five concluded that there was at least reasonable doubt that John or James Giles had committed rape. Governor Tawes commuted the sentence from death to life imprisonment. The committee persisted. By 1966 the U.S. Supreme Court agreed to hear the case. The outcome has been chronicled here and in the January and February Notes. Of the members of our Class, only **Al Picardi** (now of Rockville, and hence Montgomery County, Md.) has read the article in the *Washingtonian* magazine. Al mentioned Harold Knapp at a meeting in New York with **Robert Faurot** and four members of the 25th Reunion Gift Committee. He reports no recognition or response connecting Harold with the case or the January notes in the *Review*. **Jack Barnby** of our secretariat and **Bill Cooley** of Bethesda (and hence also of Montgomery County, the scene of this celebrated case) expressed open mindedness but no certainty that Harold had indeed saved Maryland from a grievous error. In the months ahead I hope to get the reaction of classmates who have examined this material at length. Incidentally, I learned from Barbara Knapp that Harold's father is the late Harold A. Knapp, of the Class of 1917, which held its 50th Reunion last June.

Regarding our own approaching 25th Reunion, I have not heard from **Burton Bromfield**, Chairman of the Reunion Committee, but I expect we shall hear from the Committee soon. . . . **Robert A. Veitch** and wife, his Pearl of Huntington, N.Y., announce the birth of a son, Robert

Alan Veitch, on January 13, Congratulations, Bob and Pearl.—**Paul M. Robinson, Jr.**, Secretary, Navy Information Systems Division (Op-914H), Pentagon 4D525, Washington, D.C. 20350, 202-697-6115 or 7710 Jansen Drive, Springfield, Va. 22150, 703-451-8580; Assistant Secretaries: **Paul M. Heilman, 2d**, Copper Development Association, 405 Lexington Avenue, New York, N.Y. 10017, 212-687-6500 or 30 Ellery Lane, Westport, Conn. 06880, 203-227-3469 and **John G. Barmby**, I.I.T. Research, 1825 K Street N.W., Washington, D.C. 20036, 202-296-1610

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In going through my notes, preparatory to writing these few lines, I found a very interesting article by our tennis playing Reunion Chairman, **Alex Pasiuhov**. It is a reprinting entitled "The Transportation of L.N.G. by Ship" and covers the many aspects of ship design pertaining to safe economical handling of liquefied petroleum gas. There are now three proven tank concepts—free standing, semi-membrane and fully integrated—that may be utilized in vessel construction. Alex further points out that ships coming into service this year will leave a capacity of some 40,000 cubic meters which is eight times that of the first ship put into service in 1959 which, as I recall, was to transport products up the Mississippi to Illinois. . . . **Horace Robson** dropped a brief note to advise that he is now Plant Technical Director of the Montgomery, Ala., plant of Union Camp Corporation. . . . **Bob Kingston**, now leader of the optics and infrared group at Lincoln Labs, was recently a featured speaker at the Columbia University School of Engineering. The subject of his talk was the carbon dioxide Laser System: generation, transmission and detection of coherent infrared waves. After receiving his B.S. and M.S. degrees in electrical engineering Bob obtained his Ph.D. in physics from the Institute in 1951. . . . **Martin Schwartz** has recently moved from Maryland to Santa Ana, Calif. . . . Some reported intrastate moves find **Jerry Cox** now in St. Louis, Mo.; **Henry Rowan** in Rawocas, N.J.; **Edwin Cavanagh** in Sierra Madre, Calif.; **William Whitehill** in Goleta, Calif.; and **James Fitzgerald** now at 34 Garden Street in Boston. . . . In early February I rode a few ski tows at Glenwood, N.Y., with fraternity brother, Fred Ross, '46. Our discussions pertained primarily to ski equipment and junior racing but it was the closest I've come to encountering a classmate in several months so it deserves a mention. . . . Take a few moments and drop us a note.—**Dick O'Donnell**, Secretary, 28516 Lincoln Road, Bay Village, Ohio, 44140; **Arnold Varner**, Harvey Hubbell Co., Newtown, Conn.

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20th Reunion; Harbor View, Edgartown; June 7-10, 1968; for reservations: **Adolf F. Monosson**, 85 Baldpate Hill Road, Newton Center, Mass.

As noted above, our 20th Reunion is less than two months away, so any of you who haven't as yet made reservations better do so right now (not tonight or tomorrow) else you're going to miss the gayest class get-together we've ever had. For you mariners, let your June motto be: "Whether to leeward or to windward, set your course for Martha's Vineyard!"

Happily, we wish to report that some have taken time to write us, such as **Bob Lovezzola**, X: "Over the years I've been pleased to read about the whereabouts and doings of several of my classmates thanks to the "Class Review" section of the *Technology Review*. I hope there are one or two that might be likewise interested in me. I have managed to stay in New England since graduation, working with the following companies: General Foods, Atlantic Gelatin Division; W. R. Grace and Company; Dewey and Almy Chemical Division; and Raw Materials Company, Inc. About a year ago my partner and I formed the Lovezzola-Ward Company, and we are active in the New England area as chemical distributors. We definitely feel there is a place for the distributor in the chemical industry and are out to prove the point with good service and close customer relations. Marriage did not escape me; in 1961 I met and married a lovely kindergarten teacher named Nancy and now have three children to contribute to the class statistics: Michael, 4½; Sally, 3½; and Lori Jean, 1½. Better late than never! I am living at 33 Aletha Road, Needham, Mass., and look forward to seeing or hearing from any classmates." Many thanks, Bob, and the best of luck for great success in your new business venture.

Happily, several others have taken a moment to drop us a line. **Herb Schneider**, VI-A, notes that he is on the technical staff of Bell Telephone Labs, at Holmdel, N.J. Herb, his wife Doris, and children (Tom, 11, and Linda, 10) spend their free time enjoying skiing (Herb's on the Ski Patrol), canoeing and hosting.

Bob Charney, II and XV, writes that he is Manager of Systems and Programming for Union Data Service Center, the E.D.P. arm of a group of mutual funds. Bob is married to a lovely gal named Geraldine and they have two fine children, Pamela, 13, and Scott, 11.

Another welcome note came from **Steve Davenport**, II, who wrote: "Just returned from two years in Munich, Germany, where I was Manager of Operations for the Engineering and Construction Management of the Trans-Alpine Pipeline from Italy, across Austria, to Germany—beautiful country! While there, the whole family (wife Patricia and children Diana, 15, Tom, 13, and John, 10) loved skiing in the Alps." Steve's new address is 1572 Tarrytown Street, San Mateo, Calif. 94402. . . . We are happy to report that **John Wolfe**, IX-B, was promoted last fall to President of the newly created division, Itek Optical

Systems, by Itek Corporation in Lexington. The new division is the result of a consolidation of two of Itek's government systems activities. John was formerly Vice President and General Manager of the Systems Development Division, part of the combined operation. In his new position, John is responsible for all phases of execution on major contracts involving the development and production of photo-optical, electromechanical and graphic data processing. With Itek since 1958, John has an E.E. degree from Northeastern in addition to his S.B. from Tech. He lives at 111 Richardson Drive, Needham, Mass.

Another Course XV man has "arrived" having followed that remarkable road as outlined so ably and capably by the late Professor Schell. We are referring, of course, to **Mike Kami** who responded to an inquiry from **Bob Mott** last fall saying: "The M.I.T. Alumni Association is very efficient, and a change of address in my case does mean a change of position. I am attaching a biography which will bring you up to date on my official activities. My wife Kay, my children, Gail (12) and Jim (10) and I have moved to Lighthouse Point, Fla. We live on the water and hope to enjoy the sea and sunshine of southern Florida. We are planning to do a lot of fishing and cruising in our new boat. We will always be glad to see classmates and friends who can drop in for a cocktail, but I cannot guarantee them a sailfish or a marlin, yet. I plan to do some consulting which will involve travel, but I placed my fee so high that I will spend most of my time fishing in Florida." Mike's resume went on to explain that he was formerly Vice President of Corporate Planning for the Xerox Corporation in Rochester, N.Y. Before joining Xerox, he worked for I.B.M. from 1952 to 1964 serving lastly as Corporate Director of Long Range Planning. He has now organized and become President of two newly formed companies: Corporate Planning Associates, Inc., specializing in corporate growth; and Marine Sciences, Inc., an oceanographical research organization. Mike's new address is 2456 N. E. 26th Street, Lighthouse Point, Fla. 33064.

Besides clippings, another great source of information for these notes that we value so highly is that wonderful "invention" the news section on the Alumni Fund return envelopes. **Nelson Alpert**, who took his Ph.D. in physics with us, left Perkin-Elmer Corporation last December and has taken a new position as Director of Instrument Development at Becton Dickinson and Company, Hackensack, N.J. . . . **Jim Guida**, VI, writes: "Retired from the Navy as Commander in 1961, and am still trying to adjust to electronic engineer's role at the Naval Research Laboratory!" The stamped return address also indicates that Jim is a radio ham (W3RNY). His address is 2904 Newcastle Avenue, Silver Spring, Md. 20910. . . . **Dan Hunt**, XIII-A, S.M., who has been head of Project Mohole at the National Science Foundation, has advised us that the project is being ter-

minated and closed out by the government. Dan is presently Special Assistant to the Director of N.S.F. . . . Formerly a petroleum economist with the Pan American Petroleum Corporation in Tulsa, Okla., **Whit Mauzy**, VI, wrote that he has joined Crest Engineering which does consulting engineering worldwide for the oil production and processing industry. Initially, Whit will be located in Libya. Best wishes on your new venture, Whit. Let us know if you find any ski slopes in north Africa. As many of you may know, he managed the ski area, then known as Cave Mountain (now Windham), at Windham, N.Y., about a dozen years ago.

Lyman Morgan, X, is an Engineering Specialist at the Textile Division of Monsanto in Pensacola, Fla., where his work involves the development of stream analyzers for process control. He lives in Pensacola with his wife Evelyn and five children, ages ranging from five years to 14. His spare time is devoted to the garden and helping the local Republicans. . . . After two years in Bangkok and six months in Japan for Daniel Mann Johnson and Mendenhall, **Ted Thal**, IX-B, is now Supervisor of Plant Maintenance and Operations for the Fifth Air Force. He lives with his wife and three teenagers near Fuchu Air Station west of Tokyo. Ted's address is: Theodore E. Thal, HQ. SAF, Box 1275, APO 96525, San Francisco, Calif. . . . Inadvertently, the *Review* office sent us one Alumni Fund return envelope that should have gone to Fletch Eaton, Secretary of the Class of 1949. It was from Bill Reynolds, I, who was captain of the varsity crew in 1948. Bill writes: "We are trying to arrange a special crew reunion of all 'men of the boathouse' in 1968." Because of the late publication of this item, we suggest that all those interested immediately contact Bill (William P. Reynolds, President and Treasurer, Reynolds Brothers, Inc., 756 Washington Street, Canton, Mass.) or Jack Frailey, '44, Head Crew Coach and also Director of Student Aid at the Institute. . . For those of you who delight in the mental gymnastics of operational calculus supported by computer analysis, we suggest a paper **Dave Lindorff**, VI, published in the October, 1967, issue of *I.E.E.E. Transactions Automatic Control* entitled "Control of Nonlinear Multivariable Systems." Dave's paper presents a method of controlling nonlinear nonautonomous multivariable systems in which the control variables are subject to magnitude constraints. The system is designed to track a nonlinear model within some region of the state space, the size of this region being a function of certain model parameters. To illustrate the method, Dave applies the technique to the control of an exothermic chemical process. After taking his S.B. at Tech, Dave continued his studies at the University of Pennsylvania where he received his M.S. degree in engineering. He then took the Dr. Ing. degree from the Technische Hochschule, Darmstadt, Germany. In 1950 he was an E.E. Instructor at Purdue, and since 1951 has been at the Univer-

sity of Connecticut where he is currently Professor of Electrical Engineering.

Bob Day, XV, is now Regional Sales Manager of the Foxboro Company, supervising personnel in their various sales offices from Augusta, Maine, to New York City. Previously he served as Marketing Manager of the firm's Van Nuys, Calif., division and as Manager of the Pittsburgh branch Sales Office. . . . Last June A.T. and T. announced the appointment of **Roy Watson**, VI, as General Manager of its Central Area Long Lines operations with headquarters in Chicago. Formerly Plant Operating Engineer at Long Lines Headquarters in New York, Roy began his career with Long Lines right after graduation from the Institute. His early years involved assignments with the traffic, plant, sales and accounting departments. He was appointed Area Plant Manager in Chicago in 1963, and moved to A.T. and T.'s headquarters for an administrative assignment in 1965. . . . **Bill Harris**, III, Sc.D., was Co-chairman of an Engineering Foundation research Conference held at the University of California at Santa Barbara last summer. Bill is currently Assistant to the Vice President, Battelle Memorial Institute at the Washington office. Bill's address is 1755 Massachusetts Avenue, Washington, 36, D.C. . . . **Al Kelley**, VI, Dean of Boston College's School of Business Administration and former Deputy Director of N.A.S.A.'s Electronic Research Center in Cambridge, was appointed to the Council on Engineering Affairs of Manhattan College. He will serve on the Consultor Committee on Electrical Engineering. . . . **Cliff Carlson**, VI, has become Senior Engineer in the Department of Buildings and Grounds at Harvard. Cliff lives at 497 Water Street, Wakefield, Mass. . . . **Frank Guptill**, X, Senior Research Chemical Engineer at Texaco's Beacon (N.Y.) Research Laboratories, received his 12th patent on petroleum processing last summer. The patent deals with a new method of eliminating by-product carbon in the Texaco partial oxidation process. Frank has been associated with Texaco ever since leaving Tech, and during this time has also earned an M.S. from New York University. In addition to his regular duties, Frank also serves as Village Engineer for Fishkill, N.Y.

Harold Conroy, V, was promoted to full Professor last summer in the Chemistry Department of Carnegie-Mellon University. . . . An expanded quality control program, including product development, product audit and technical services, was noted by I.G.A. in an announcement naming **Macey Feingold** to the position of Manager of Quality Control and Technical Services for the Independent Grocers' Alliance. . . . It is indeed a pleasure to note that my old buddy **Bruce Morrell**, II, has been promoted to Lieutenant Colonel in the Air Force. Bruce is Assistant Professor of Aeronautics at the Air Force Academy. He previously served with the Ballistic Systems Division at Norton A.F.B., Calif. A veteran of World War II and Korea,

Bruce earned an M.S. degree in aeronautical engineering in 1956 from the Air Force Institute of Technology. He and his wife, Norma, reside at the Academy. . . . In closing, we are indeed sorry to report the deaths of **Sylvan L. Cahn**, VI, on July 3, 1967; and **Robert L. Deming**, VI, on November 21, 1967.—**John T. Reid**, Assistant Secretary, 22 West Bryant Avenue, Springfield, N.J. 07081; **Robert R. Mott**, Secretary, Kent School, Kent, Conn. 06757; **Richard V. Baum**, Assistant Secretary, 6711 North 22d Street, Phoenix, Ariz. 85016

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William Z. Leavitt has been appointed Chief of the Measurement and Instrumentation Techniques Laboratory at N.A.S.A.'s Electronics Research Center, Cambridge, Mass., according to an announcement by Director James C. Elms. Dr. Leavitt joined N.A.S.A. in November of 1964 after nine years at the U.S. Army Materiel Research Agency, Watertown, Mass., where he was a member of the Steering Committee of the Interdisciplinary Research Laboratory and was responsible for programs in nuclear physics and chemistry, instrumentation and health physics. From 1953 to 1955 he was a member of the Research Staff of the Massachusetts Institute of Technology Lincoln Laboratory, Lexington, Mass. Dr. Leavitt is a native of Boston, Mass. He received his elementary and high school education in the public school system of Boston, and graduated from the Boston Latin School in 1943. In 1949 he received bachelor of science degrees in both chemistry and chemical engineering and in 1953 his doctorate degree in chemistry, all from M.I.T. During World War II he served in the Aviation Branch of the U.S. Navy. He is a member of the Aerospace Medical Association, the American Chemical Society, the Institute of Electrical and Electronics Engineers, Group on Engineering in Medicine and Biology and the Instrument Society of America. Dr. Leavitt's wife is a practicing radiologist at St. Elizabeth's Hospital in Boston. They have three sons and reside in Newton, Mass.

John D. Alden is Director of Manpower Activities for the Engineers Joint Council operating out of New York City. He is concerned, among other things, with the critical and continuing problem of an insufficient supply of new engineers. Although the demand for engineers is greater than ever and starting salaries are at an all-time high, enrollments in engineering schools continue to drop. John attributes the declining popularity of engineering to two factors: first, the courses are tougher and, since jobs are available in many fields, students tend to seek easier degrees; and second, today's students prefer careers in the social sciences and humanities. John's study of the engineering profession will have appeared in the *March Review* by the time you see these notes. If you missed it, I think you will find it worthwhile to go back for a look. . . . Again my

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thanks go to those who have taken the time to send me news of their activities. **Norman Chrisman** was recently elected President of the Kentucky Society of Architects. He is a partner in the firm of Chrisman and Miller, Architects, Lexington, Ky. . . . **Joseph Yamron** has been appointed Assistant to the Chief Scientist of the United Aircraft Corporation, primarily concerned with corporate activities in electronics.

Alan W. Collins, whom I last saw at our 5th Reunion, writes that he feels quite settled now after having toured Europe for a couple of years (working out of Copenhagen as a Management Consultant). He is: Manager of Engineering Management Information Systems at Grumman Aircraft Corporation; Commander in the United States Naval Reserve and Commanding Officer of Reserve Patrol Squadron 831, Naval Air Station, New York; trustee of Three Village School Board (building five schools for a total of 9); trustee of Stony Brook Community Fund (colonial restoration and maintenance); and planning to do some serious sailing this summer with his wife and three children. . . . **Col. William S. Hutchinson, Jr.**, X, says that he is now retired from the United States Army and is working with a Cornell Aeronautical Laboratory group in systems research and analysis for rural security in a joint Thai-U.S. research center in Bangkok. . . . **Lindsey R. Perry**, who is President of Pilgrim Homes of New England, Inc., in Danvers, Mass., writes that he is now building a 20-unit complex of high rent town houses (\$350-\$400 per month) in a subdivision of \$40,000 and up houses that he has just completed. He is also developing 250 acres of land on Nantucket Island into an all-season vacation area with homes ranging from \$35,000 to \$80,000. . . . **Fred W. Reuswig** is Head of the Civil Design Group and Chief Hydraulic Engineer of Stanley Consultants in Muscatine, Iowa. He and his wife Betty have four children: Mike (21), Pat (17), Dave (16), and Cathy (11). Last year he travelled to Switzerland, Italy, Liberia, Peru, and several of these United States. This year he will be getting to Liberia, Costa Rica, and several states. . . . **Douglas E. Steinman, Jr.**, is Vice President of the Texas Society of Architects for 1968. Doug is a partner in the firm which bears his, and his father's, name. The firm is located at 975 Interstate 10, North

Beaumont, Texas.—**Feltcher Eaton**, Secretary, 42 Perry Drive, Needham, Mass. 02192

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Clark Abt of Lexington, President of Abt Association of Cambridge, had his paintings on display at the Newton Free Library together with his poetry and other publications. He was manager of Raytheon's Advanced Systems Management until 1964 when he formed his own company. He started with two workers and expanded rapidly into a Research and Development firm expected to gross sales of \$1,000,000 in 1968. . . . **David Atlas**, S.M., Sc.D., XIX, a meteorological expert, recently gave a lecture on "Radar Fluoroscropy of the Clear Atmosphere" to the local chapter of the American Meteorological Society in Champaign, Ill. Dave is a Professor at the University of Chicago. . . . **James Ballou** has his own architectural firm in Salem, Mass., doing a variety of work. He is starting a realty trust to buy up buildings in blighted areas and upgrade them. Jim has five daughters, ages 6 through 17. . . . **Dave Bobroff**, E.E., VI, is working for the Raytheon Research Division in Waltham, Mass. He recently co-authored a paper with **Hermann A. Haus** on "Eigenvalues of Characteristic Noise Matrix of an Electron Beam with Half-Maxwellian Velocity Distribution." If you think the title is something you should see the article. . . . **Mel Bowers** and Julie live in Edgewater, Md., with children, Allen, 13, John, 11, and Jeanette, 10. Mel is Program Manager with Chesapeake Instrument Corporation making oceanographic and marine instruments. . . . **Marvin Burns** is with the I.I.T. Research Institute (formerly Armour Research Foundation) managing a group in design and development of bio-medical devices. He lives in Wilmette, Ill., and has two children, ages 4 and 2. He says they are getting used to the Mid-West but they miss all their friends in the Boston area. . . . **Bill Carmack** is Product Manager for I.T.T. Controls and Instruments. He lives in Monterey Park, Calif., with wife, Marilyn and children, William, 2d, 18 and Ann, 13.

Charles Carpenter writes to say that he married Alida M. Baker, University of New Hampshire, '44, on September 30, 1967. Congratulations to both of you and wishes for many years of health and happiness. . . . **Earl Cole** is Director of Management Technology for the Space Division of North American Aviation, Inc. He and Donna Rae live in Orange, Calif., with children, Steven, 21, Mark, 17, Lisa, 12, Karen, 10 and Cheryl, 6. . . . **Bill Diffin** is now Manager of Materials and Product Design Engineering for the General Electric Company in Oklahoma City, Okla. He lives in Bethany, Okla., with wife Virginia and Bill, 13, Joyce, 12 and Brian, 7. . . . **Bill Ericson** and Carol Lee live in Pittsburgh, Pa., with family, John, 12, Bill, 10 and David, 9. He is Manager of Manufacturing and Engineering Services for North American Rockwell

Corporation. . . . **Alfred Ginkel** and Jean have three children, Susan, 13, Elizabeth, 10, and Carolyn, 7. Al is General Manager of Degna Ltd., a subsidiary of Ritter Pfaudler Corporation in Hong Kong, B.C.C. . . . **Jim Hart** is Director of Projects and Administration for Andrew Corporation in Orland Park, Ill. Jim and Ancella have three children, Ruth, 8, David, 6, and Rachel, 4. . . . **Prof. G. W. Hughes**, School of Electrical Engineering at Purdue University, is participating in a National Institute of Health program to study how living organisms receive, distinguish and store outside signals and translate them into action. George is on sabbatical this year and is spending it as Visiting Professor of Biophysics at Johns Hopkins University. . . . **Captain Jerome H. King, Jr.**, S.M., VIII, U.S.N., has been selected for promotion to the two-star rank of Rear Admiral. He is presently the Executive Assistant and Senior Aide to the Chief of Naval Operations in Washington, D.C. He and wife, Jane have three children, Judith, 18, Nancy, 16, and Sally, 13. . . . **Edwin J. Martin, Jr.** is a Staff Engineer for Wilcox Electric Company. He is a Lecturer in Engineering at U.M.K.C., a Lecturer in E.E. and a member of the Graduate Faculty at U. of Kansas. He and wife Ruthelma have three children, Edeen, 20, Abigail, 8, and Sarah, 4.

Anthony Mirti, formerly Executive Assistant-Programs for United Aircraft's Hamilton Standard Division, has been promoted to the newly created position of Manager of the Space System Department. Major programs in his department include the life-support back pack for the Apollo astronauts and environmental control systems for the lunar moon landing spaceship and the Air Force's Maned Orbiting Laboratory. . . . **Eugene Oster** and Carolyn with children, David, 5, and Jennifer, 3, live in Toledo, Ohio. Eugene is Director of Corporate Engineering Research for Owens-Illinois, Inc. . . . **Janice Rittenburg Rossbach**, S.M., XVIII, is an Engineering Specialist at Sylvania Electronic Systems in Needham, Mass. Janice and Leopold (M.I.T. '50), live in Weston, Mass. . . . **John L. Roper**, III, Assistant General Manager and Vice President of Norfolk Shipbuilding and Drydock Corporation, has been elected a Director of the Norfolk Federal Savings and Loan Association of Norfolk, Va. . . . **John Ryan**, S.M., X-A, works for the Oleofins Division of Union Carbide Corporation in S. Charlston, W. Va. John and Sara have three children, Jesse, 11, Mary, 10, and Julia, 8. . . . **David Schoeffel** and Pat live in Kirkwood, Mo., with their three children, Carol, 12, Sara, 10, and Tommy, 8. Dave is a Purchasing Specialist in Raw Materials for Monsanto Company. He sees **Marty Troster** o Union Bag company from time to time. . . . **Robert Shaffer** and Joyce have three children, Paul, 13, Alex, 12, and John, 5. They live in Cochranville, Pa., where Robert is employed by E. I. du Pont de Nemours and Company. . . . **Robert Stephenson** was transferred in January, 1967, from the Massen, N.Y., operations of Alcoa to the

Point Comfort, Texas, operations where he became Chief Industrial Engineer. He his wife Joanne and children, Tom, 13, Ann, 11, Jean, 8, and Bobby, 3, live in Port Lavaca, Texas. . . . **Albert Zesiger** writes that he has joined Lazard Freres, New York brokers, to supervise their Advisory Accounts and Institutional Sales. The Company has been publicized recently for the McDonnell-Douglas and the United Artists-Transamerican mergers.—**Walter O. Davis**, Assistant Secretary, 346 Forest Avenue, Brockton, Mass. 02401 brought you this month's news; **Howard L. Livingston**, Secretary, 358 Emerson Road, Lexington, Mass. 02173; Assistant Secretaries **Paul Smith**, 11 Old Farm Road, N. Caldwell, N.J. 07006; **Marshal Alper**, 1130 Coronet Avenue, Pasadena, Calif. 91107

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George A. Uberti is Chief Marine Engineer at the Philadelphia office of the J. J. Henry Company, Inc., a ship design firm. . . . **Joseph S. Pressner** coordinates production control activities at Turner Manufacturing Company, the world's largest manufacturer of wall accessories, in Chicago. Joe is married and has two sons, Michael and Richard. . . . **Jerome B. Cohen** reports that he is settling in again as Professor of Materials Science at Northwestern University after a sabbatical year with the Office of Naval Research. When not wandering through Europe and the Middle East as part of the Navy's exchange on Research and Development, he enjoyed the pleasures of living in London. . . . **George Inada**, who had been employed by Westinghouse Electric Corporation since 1954, has joined the MITRE Corporation's Washington office. George is married with one daughter and is a Captain in the Army Reserves. . . . **H. A. Sandmeier**, '52, is active in the study of "nuclear weapons vulnerability, i.e. U.S. warheads attacked by neutrons or x-rays." He comments, "not much personal publicity, but interesting." . . . **Sy Grossman**, drafted into the U.S. Army last summer, is Assistant Chief of Gastroenterology at the 1,000-bed Brooke General Hospital. . . . **David L. Wiesen** was married a year ago September to Muriel Lechter, a Cornell grad. Dave is active in the U.S. Power Squadron, the East Orange Tennis Club, winter skiing, and summer sailing. The Wiesen reside in Newark. . . . **Arthur Coren** moved to Highland Park last June with wife Judy and children Linda, 10, and David, 6. A year ago Art formed Coren-Waters, Inc., which represents manufacturers of electric power, process control and electric heat equipment. He is working (evenings) on an M.B.A. in marketing at Northwestern University.

Richard Mapes is a part time faculty member at Sacramento State College, in addition to his engineering position at Aerojet General. . . . **Thomas H. Bird** has been busy at Cal Tech's Jet Propulsion Laboratory with the Surveyor Program, which has been taking those

excellent pictures of the moon. Tom's responsibilities are for the television camera activities, but he reports that he still finds time for his family—wife Jeannette and year old son Brian. He also reports that he occasionally sees **Stewart Smith**. . . . **George E. Klein** is now at Stanford Research Institute. He received a Ph.D. from the Alfred P. Sloan School of Management in 1966. . . . **George Okun** is in Contracts Administration on the F111B Aircraft at Grumman Aircraft. He enjoys sailing a Rhodes 19 with son John, age 10.

Carl W. Schmid is presently with Scott Paper Company at the Chester, Pa. plant . . . **Leonard S. Rolnick** has been named Corporate Advisor, Management Science, in the newly created Computation and Communication Services Department at Gulf Oil Corporation in Pittsburgh, Pa. . . . **Albert A. Ward, Jr.**, has been promoted to Product Administrator—Sheet and Strip Products—Commercial, U.S. Steel. His duties include price planning, product distribution, facilities planning and coordination of advertising and marketing.—**E. David Howes, Jr.**, Secretary, Box 66, Carlisle, Mass. 01741

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After 8½ years in Germany, **Norry B. Hersey** is back in the States and is serving as Chief, Systems Development, for the Army and Air Force Exchange Service in Dallas, Texas. He writes that he sees **Harry Schreiber** every few months in Dallas and that he last saw **Phil Gruber** and **Ben O'Brien** in Munich in 1965. Norry is married and has three children, two boys and a girl. . . . California mail has been particularly heavy this month. **Robert Bowman** writes from Northridge that he is the West Coast Representative for the AVCO Corporation. Bob and Miriam have two daughters, Leslie, 10, and Carol, 7. . . . **John McMasier** tells of his promotion in February, 1967, to the position of Head of Aerodynamics in the Advance Development Projects Department of Lockheed. This was followed by a short commercial which we won't repeat since the Review Advertising Department might send John (or us) a bill. . . . **Paul Valentine** has left the Office of The Secretary of Defense in Washington. He is now with the law firm of Spaeth, Blase and Farman in Palo Alto. . . . After two years of marriage, **Harlan Walker** brought his wife Jeri to New England to meet his family and visit M.I.T. and Durgin Park. The Walkers are living in Lakewood, Calif., and Harlan is working as a Materials and Process Development Engineer for Lockheed. . . . **Bill Chandler** has forsaken the far north (Cloquet, Minn.) for the tropical delights of the San Francisco Bay area. Bill is now Corporate Planning Analyst for Potlatch Forests, Inc., where he has been since graduation. If anyone is redoing his house this spring, you might see Bill for paper, lumber, plywood, paperboard and all.

Lyle Warnock sends greetings from Grand Rapids, Mich., where he, Anne, David (9) and Todd (7) are becoming well-rooted. He reports that they have become enthusiastic skiers, and by the time you read this they will probably list the Rockies among their "conquered peaks." Summers find them in their Sailfish. Lyle is halfway through an M.B.A., while Anne is taking an evening course in Wall Street. Lyle is banking on her promise "to retire us to the academe in no more than 40 years." Lyle is Department Manager for Inertial Navigation Systems with Lear Siegler.

We would like to apologize to **Duwayne Peterson's** wife, Nancy, whom we called Mary last year. Pete confesses that the error was doubtless the fault of his handwriting and that it has really caused havoc! So a word to the wise: we cherish these notes on the Alumni Fund envelopes and other correspondence—especially those that are legible. Pete left Grosse Pointe last summer for a seminar at M.I.T. and saw several classmates and old friends. He then took up skiing, in time to break an ankle on New Year's Eve. . . . **Pete Pratt** is still in Roseburg, Ore., with the Roseburg Lumber Company. In November he became Manager of a newly acquired plywood and sawmill complex and he is also working on plant layout of a plywood plant now under construction. . . . **Bob Trainer** and his wife and children (a son, 5, and a daughter, 2) are in the Los Angeles area. Bob is managing contracts for Computer Science Corporation, having served as a Vice President of Digitek the past two years. Prior to Digitek he was with Nortronics. . . . **Bob Temple** writes that he and Katrina and their sons (now 13 and 11!) have enjoyed their four years in Atlanta although they see more alumni in their travels to "exotic places like Europe, California, Pittsburgh and Mansfield, Ohio." Bob is Director of Planning and Development for American Cryogenics, an affiliate of Standard Oil of N.J. . . . Commander **Robert Duin** is presently Chief of the Production Department



William J. Neff, '55

Reduced Travel Rates FOR M.I.T. ALUMNI



Tours to the
Orient,
India

For details
see page 78

at the U.S. Coast Guard Yard, Curtis Bay, Md. . . . **Frank Buck**, Manager of Radio-active Products with the U.S. Radium Corporation, Bloomsburg, Pa., writes that they have a daughter, going on 2, and three sons, ages 7, 6 and 3. . . . **Lewis Russell** and his wife and three children (Helen, 11, Carol, 9, and John, 7) are living in Oxford, England. Lewis is Leader of the Plutonium, Ceramics and Metallurgy Group in the Ceramics Division of the Atomic Energy Research Establishment, Harwell. . . . In November **Bill Neff** was elected a Vice President of Booz, Allen Applied Research, the firm which he joined in 1960, after serving with the Air Force and the F.A.A. He is in their Kansas City, Mo., offices. . . . Thomas-Brooks, Inc., in which **Fred Brooks** has done the engineering in the innovation of techniques for system recording and modeling and for whom he has made other contributions in the field of man-machine system design, became part of the Stanwick Corporation in December. Fred will continue his work at new headquarters in Arlington, Va. . . . **Stanley Barriger** writes enthusiastically of returning to Boston early this year. You can now find him in the Transportation Department of United Fruit. . . . **Charles Ladd** is spending part of his sabbatical leave (from M.I.T. where he heads the experimental work in soil mechanics as an Associate Professor in Civil Engineering) with Haley and Aldrich, Inc., in Cambridge as a Visiting Consultant. But he has also taken advantage of his freedom this year by making trips to Norway, Japan and Thailand. He speaks enthusiastically of sabbaticals!

Gerald Kliman, an Assistant Professor of Electrophysics at R.P.I., writes that

he and Edith have a son, Jonathan, born last June. . . . **John Lindenlaub's** Christmas letter is convincing proof that he, Debby and their four children have few dull moments. John, an Associate Professor at Purdue, and Debby are active in (among other things) their church and in the Danforth Foundation Associates' program, "some of the aims of which are to encourage good teaching and to assist in personalizing the educational process." . . . **Paul Federbush** is at the University of Michigan in the physics department.

David Scott, Chairman of the Department of Architecture at Washington State University in Pullman, recently represented M.I.T. at the inauguration of their new president. . . . Finally, **Francois Vigier** was appointed Director of the Center for Urban Studies in the Graduate School of Design at Harvard in December. At Harvard since 1960, he became Associate Professor of City Planning and Design in 1966, and in 1963 he was Visiting Critic in Urban Design at the University of North Carolina, and in 1962 and 1964 Visiting Lecturer in Art at Dartmouth. He is also Executive Vice President of Nash-Vigier Planning Consultants in Cambridge.—**Mrs. Dell Lanier Venarde**, Secretary, 16 South Trail, Wilmington, Del. 19803; **L. Dennis Shapiro**, Secretary, Aerospace Research, Inc., 130 Lincoln Street, Boston, Mass. 02135

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Paul Abrahams writes that he and **Clark Weissman** have been appointed National Lecturers for the Association for Computing Machinery for 1967-68. Paul's specialty is Programming Language for Artificial Intelligence. In addition, Paul was appointed Assistant Professor of Mathematics at N.Y.U. last September. . . . **Nick Biwer** has been found at Construction and Engineering Company (C.E.C.O.) in Luxembourg. . . . **Linden Kibler** expects to complete his Ph.D. in electro-physics at Brooklyn Polytech this June. . . . **Dick Norwood** has received an Outstanding Invention Award from I.B.M. for a patent entitled "Fluid Operated Logic Devices." Dick is now an Advisory Engineer in Tape



Fred A. Brooks, Jr., '55 (left), and his associate Dr. Robert Thomson.

Device Development at I.B.M.'s Boulder Colorado Systems Development Division Lab. He has been with the company since 1961. Dick, Anne and their three children moved to Boulder in 1966. . . . **Paul Polishuk** is a local nominee for one of the Jaycee ten Outstanding Young Men of the Year awards. Paul is a Senior Research Physicist at Wright Patterson A.F.B. specializing in nucleonics, and he has been there since graduation. His master's and doctor's degrees were achieved by part time work at Ohio State. Paul and Elaine have four children, two boys and two girls. . . . **Jack Rosenfeld** has turned up on the staff of Columbia University as an Adjunct Associate Professor of Electrical Engineering working on the Computer Science Program.

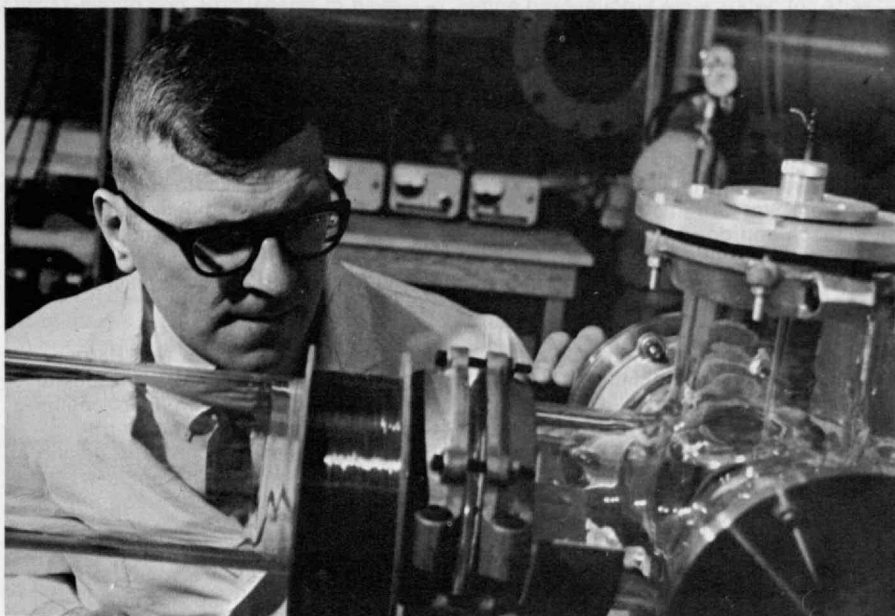
Bill Grinker has announced his association in a new venture to be named The Boston Computer Group, specializing in computer leasing and consulting. Bill will serve as Executive Vice President. . . . **Bjorn Rossing** writes that he was elected Mayor of Brooklyn Park, Minn. (population 18,000), in December. This is a moonlighting job and during the day he is a Systems Analyst at Honeywell's Aerospace Division in Minneapolis. Bjorn and Enid have two daughters, Janice Anne and Karen Elizabeth. . . . M.I.T. is sharing **Jack Saloma** with Harvard this Spring. He will lecture there on American National Government. . . . Our most recent communication with **Mike Turin** finds him, with Phyllis and their three children, in Southern England where he is heading the Large Scale System Design Group for I.B.M. World Trade. Mike enjoys his work tremendously and is not really looking forward to returning to New York for reassignment in 1969. . . . **Bill Wolf** and the rapidly expanding Wolf Research and Development Company joined E.G. and G. at the beginning of the year. . . . **Tom Doherty** writes that he has a new house and job in Toronto.—**Bruce B. Bredehoff**, Co-Secretary, 16 Millbrook Road, Westwood, Mass. 02090; **T. Guy Spencer, Jr.**, Co-Secretary, M.I.T., Room E19-439, Cambridge, Mass. 02139

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My first order of business this month is to extend to **Harry Flagg** my apologies for failing to include him in the list of classmates who attended our 10th Reunion. In a letter to me Harry states reprehensively: "I even recall that I got a medal for traveling the longest distance." Included with Harry's letter was a six-month's report to shareholders of Telecheck International, the firm that Harry founded and operates in Hawaii. The progress of the company seems to be excellent. Recently Telecheck acquired two business colleges in Honolulu and has extended its diversified computer services to include account receivable billings, computerized control of construction projects and scientific and business research analy-

ses. S.E.C. registration and listing of the shares on the local Honolulu Exchange is projected for the near future. Harry notes in his letter that he works very closely with Bill Daly, '58, and manages to get back to Boston at least once a year. . . . I was in the States for a few weeks at Christmas time and saw a number of classmates during a short visit to the Boston area. John Decker, '58, and Linda's new home is certainly magnificent. Perched on a hilltop outside of Concord, Mass., there is a fine view of the mountains in southern New Hampshire. John is now Director of the Physics Group in the Space Physics Division of Comstock and Wescott, Inc., in Cambridge.

Over lunch at the Window Shop on Brattle Street, **Mal Jones** gave me a run-down on his work as Assistant Director of Project M.A.C. The M.I.T. announcement of Mal's appointment to this post provided the following biographical notes: "Professor Jones received the S.B. and S.M. degrees in economics from M.I.T. in 1967 and 1958 respectively. During the academic year 1957-58 he was a Research Assistant in the M.I.T. Computation Center. After completing his master's degree he was called for active duty with the Air Force, and was discharged as a First Lieutenant in 1962. Throughout his tour of duty he served in a technical capacity, in Washington, D.C., as a Computer Systems, Engineer. He returned to M.I.T. in the fall of 1962 as a graduate student and received his doctor's degree in 1967 under the supervision of an interdepartmental committee representing the Sloan School of Management and the Department of Electrical Engineering. He was appointed an Instructor in the Sloan School of Management in 1965 and was promoted to the rank of Assistant Professor in February, 1967. Professor Jones was one of the original participants in Project M.A.C. and attended the 1963 Summer Study. His primary technical interest has been in simulation languages and he has made substantial contributions to the development of O.P.S. He has taught various subjects in the general area of management information systems and he is presently in charge of 15.54—Management Information Technology, and in co-charge, with Professor Donald C. Carroll, '58, of the graduate subject 15.541—Management Information Technology (A)." . . . Mal passed on the news that **Gary Dischel** was remarried on December 3 to the former Carolyn Jacobsen of Maine, in the M.I.T. Chapel. **Ron Keefe** was among the guests. A sumptuous reception was held at the Hotel Somerset in Boston, one of the hotels owned by Hotel Corporation of America with which Gary is associated! . . . Betty and I spent an afternoon with **Bill Brandon** and Ann in Boxboro. Bill, I learned, will start in a few months on some excavations for pot sherds around the sites of 18th century pottery makers in the Worcester area. He has built up quite a collection of early American pottery and has done consid-



Paul Polishuk, '56

erable research into this subject. . . . Now back to the mailbag—David Atlas, '51, has resigned from the Air Force Cambridge Research Laboratory (Radar Branch) to become Professor of Meteorology at the University of Chicago. . . . On November 18, **Tom Carter** married the former Carol Porter, a graduate of Bryn Mawr College. Ron is with Atomics International. . . . **Stewart Crawford** dropped me the following note: "I have been living in Latin America since 1962. I am President of I.T.T. Industrial, S.A. de C.V., a Mexican subsidiary of the International Telephone and Telegraph Corporation. We visited the **Derek Allens** in Aruba a couple of years back and we see **Larry Colman** frequently—he is also living in Mexico City." . . . A message from **Harry Margulius** mentions that he and his wife Marilyn have two children. He has been an Assistant Director of the M.I.T. Instrumentation Laboratory for the last four years. His current work is in the field of Oceanography, specifically the Navy's Deep Submergence Program. . . . **Bob Palter** graduated from Harvard Business School after his days at Tech and is now a Director and Vice President of Comprehensive Financial Planning, Inc., in Los Angeles. Bob is active in the field of pension planning and is a consultant to various industrial concerns in the Southern California area. Prior to taking on this new job, Bob held various sales and general manager posts with subsidiaries of Chelsea Industries of Chelsea, Mass. . . . **Lionel Fray** is a Principal in the General Management Group at Harbridge House, Inc., an international management consulting firm. A note on him in the October issue of *Financial Executive* states that he is a specialist in systems analysis. He has directed several government consulting projects including analyses of success patterns of research and development programs for the U.S. Navy and development of an incentive structure for the Gemini Spacecraft Project of

N.A.S.A. Lionel worked in the electronics industry with Raytheon Company, U.S. Sonics Corporation and MITRE Corporation and then obtained an M.B.A. from the Harvard Business School. . . . More in 30 days. How 'bout some newsy letters?—**Fred L. Morefield**, 18 Whaddon House, William Mews, London, S.W.1. England

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10th Reunion; Provincetown Inn, Provincetown; June 7-10, 1968; for reservations: Michael E. Brose, 1171 North Street, Walpole, Mass.

Countdown! Only two months until the 10th Reunion blast. To hold a space send in your reservations right away. From all reports we expect to have a large turnout for the full weekend at Provincetown Inn on June 7-9. Nearly 250 people have made firm or tentative plans to attend. It will be a great time to renew old friendships and make new ones. And come for the full weekend—leave early on Friday so you can really relax and enjoy yourself—along with your wife, husband or guest. We'll have some tips on what to wear and what to bring in the May issue, for both the men and the gals. Return those questionnaires and also send in your class dues in order to receive your copy of the results.—Two and counting. . . . Several notes this month from our classmates overseas. **Philip Stevens** writes from Germany: "We have been in Nuremberg for five years where I am Manager of European Operations for the National Machinery Company of Tiffin, Ohio and General Manager of their subsidiary here, J. G. Kayser. We are the world's largest manufacturer of hot and cold forging equipment." . . . And from Mexico, **Luis Unikel** tells us: "For the last two years I have been working at the Colegio de Mexico, in charge of the research project Urbanization in Mexico.

At the same time, I have been doing consulting work for Arthur D. Little in Mexico City. Also have been quite active in M.I.T. Club activities and this year was responsible for the annual M.I.T. Fiesta in Mexico, being held for the 20th time." . . . Also from Germany, **Ralph Devoto** reports: "Received my Ph.D. from Stanford in 1965 and stayed on to teach and do research. Now at the Institute for Plasmaphysics in Munich (sampling the Munich beer), on an N.S.F. postdoctoral fellowship." (Sounds like Ralph may have gone to Germany because he couldn't resist the draught!). . . . **William McIntire** is now a Staff Geologist with Humble Oil and Refining Co. . . . **Melford Monsees** has joined the consulting engineering firm of Richard Muther and Associates as Executive Manager. Prior to this post he was with the U. S. Corps of Engineers.

William McGuire has been appointed Director of Personnel at Tennessee Eastman Company. He, his wife and five children are living in Kingsport, Tenn. . . . **Ken Gillis** was appointed Manager, New Products and Processes, of Wheel Trueing Tool Company in Detroit. Formerly he was with the G.E. Diamond Business section. . . . **Travis Amis** has been Vice President of Missouri Valley Machinery Company. He and his wife are living in Sioux City, Iowa, and have two children. . . . **Conrad Revak** received his M.D. last year and is currently in radiology residency at St. Francis Hospital in Pittsburgh. . . . **Martin Victor** is still stationed, HQ. S.A.C., in Omaha specializing in aerospace medicine. He reports that they have moved four times in as many years but all the family keeps busy—the children are in Scouts and his wife is teaching. . . . **Dante DiFranco** is doing stability and control research at Cornell Aeronautical Laboratory, while Elizabeth is working in the architects office of Robert Coles. They have just recently moved into a carriage house which they have converted into an attractive home. . . . **Bernard Schneiderman** received his Ph.D. last June and writes: "I am continuing my work in theoretical physics at United Aircraft Research Labs in East Hartford. Hope to see many old friends at the Reunion." —**Michael E. Brose**, Secretary, 1171 North Street, Walpole, Mass.; **Antonia D. Schuman**, Western Associate, 22400 Napa Street, Canoga Park, Calif.

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Phil Beach writes that he and his wife are continuing to enjoy their stay in Venezuela. He is now Planning Director of Industrias Lacteas, C.A., I.B.E.C.'s milk and cheese company there. They sailed their Vanguard, Borrasca, to Trinidad last month March for the race to Granada but I don't yet know the results. . . . Also enjoying life overseas is **Daniel Cameron** who has just begun a two-to-three-year stint in Tokyo overseeing Continental Oil's interest in the new Petracokes Limited. . . . Continuing our ocean-hopping, we eventually arrive in

Rome where **Dennis Lytle** informs us that he's an E.E.P. Consultant to the European clients of Touche, Ross, Bailey and Smart. He and his wife, the former Gun Hovik, '60, have two children, Wayne, 5, and Karen, 2. . . . Finally as our last stop outside the States this month, we drop by Puerto Rico where **Joaquin Borrero** has joined the Commonwealth's Economic Development Administration; he'll be applying his M.E. talents to the further development of the island's industry.

And then back home. . . . **Neil Harper** has recently been elected an Associate Partner in the Chicago architect-engineer firm, Skidmore, Owings and Merrill. He has just finished writing and editing a book for McGraw-Hill on *Computer Applications in Architecture and Engineering*. . . . **Charles Larson** writes that he and his wife Sue are enjoying life in Sunnysvale with their two sons. He is currently working in the Advanced Products Operation of G.E.'s Nuclear Energy Division, where his primary activities are in the fields of core design and safeguards analysis of sodium-cooled fast breeder reactors for electric power plants. . . . Mike Drew, '60, has forsaken industrial management so to speak; he graduates in June from Columbia's Medical School and will intern at the University of Colorado in Denver. . . . **Bob Polutchko** is in Denver already, having transferred to the "in-house" from Martin-Marietta in Baltimore. He's a Staff Engineer in Advanced Entry Systems, is married and has three children. . . . **Allen Novak** has been working since graduation—now as Assistant manager—in an aluminum extruded container plant which has recently expanded into plastics injection and blowing molding. He was married in 1963 and has two daughters. . . . After receiving his S.M. from the Institute in '61, **Louis Krasny** served as a Lt. at Fort Meade for two years. Upon release he joined Scientific Data Systems in Santa Monica, where he is currently a member of the technical staff in product planning. He and his wife celebrate their 10th anniversary this year; they have two children, Fay Ellen, 4½, and Robert, 2½.

Earl Rogers and his wife have two years on the Krasny's; they've been married 12 years and have two children, Caryn, 6, and Brad, 3. Earl has been a Chief Engineer for three years with Electro-Optical Systems in Pasadena, a subsidiary of Xerox Corporation. . . . **Philip Newell** and his wife Joan also have two children, six-year old Jeff and three-year old Wendy. Phil has been with E.G. and G. since 1960, and is now responsible for new products to support their light sources operation. He's completing work on his Ph.D. at Boston University. . . . **James Snodgrass** is with Sinclair Oil in New York as Assistant Manager of the Systems and Computing Department. He picked up his M.S. in mathematics from DePaul University in 1964. Jim is married and has two boys, ages 5 and 8. . . . **Theodore**

Musho is an Associate Architect with I. M. Pei and Partners in New York City. . . . Also in the New York area is **Michael Spring**, an Instructor in the Physics Department at the Polytechnic Institute of Brooklyn. . . . **James Conklin** writes: "My wife Betty and I have a young son whose birth, December 1, 1966 (yes, a whole year ago), was never made known to the *Review*. He is now walking and has all the inquisitiveness that a future Tech scientist or engineer should, much to the delight—and consternation, sometimes—of his parents". . . . **Howard Markham** has moved from the Old Town section of Alexandria, Va., to the "New Town" of Reston near Washington—quite a transition of atmosphere! He adds: "We spent three months touring Europe; during this time we managed not to see Rome, Spain, Portugal, Germany, most of Great Britain and Ireland and non-Parisien France. This is news? Well, the medium is the message." I think, after some pondering, that Howard is referring to the fact that his note was on his Alumni Fund envelope. In this respect he joins everyone else who's mentioned in the Notes this month. I thank you all for your contributions: news first money second (although I bet that M.I.T. doesn't see it that way).—**Glenn Zeiders**, Secretary, 3 Rose Avenue, Watertown, Mass. 02172

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Robert Gottlieb was recently appointed Vice President of Applied Analysis, Inc., a mission support contractor at N.A.S.A., at the Marshall Space Flight Center. . . . **John Karl** has moved to the Department of Physics and Astronomy at Wisconsin State University in Oshkosh as an Assistant Professor. . . . This news is from Betty Troth: "Rusty is in the army as a career officer. Except for three wonderful years in Germany, we have moved at least once a year. Believe it or not, it's rather fun, if hectic. Rusty is now in Vietnam—stationed in a Saigon suburb. **Ben Harris** is over there too, in another unit. I'm at home (St. Louis) with Jeanne (2½) and Christopher (who will be one in February)." . . . From **Terry Bower**: "After receiving my Sc.D. in metallurgy, I stayed on at M.I.T. for a little over a year as Research Associate. In September, 1965, I joined Chase Brass and Copper Company in Cleveland, Ohio, and am now responsible for cast structures research in their new Casting Laboratory. Dolores (Ogradnib from Coventry, R. I.) and I were married August 21, 1965. We have added Charles (September 3, 1967) to the family and reside in Cleveland Heights, Ohio."

Howard Hornfeld is now at the Du Pont Organic Chemicals Department. Since graduation he has spent a year in California (Santa Barbara), getting an M.S., then two years in the U.S. Army Chemical Corps working on psycho drugs, then three years in England (Earborn) for a D.Phil. . . . **Richard Thompson** writes: "After three

years in Bell Aerosystems Rockets Division, I accepted a N.A.S.A. Fellowship for a year at Princeton followed by a stint at T.R.W. Systems in California. I was called back from the West Coast by Dr. Jerry Grey, a former Princeton Aerospace Department Professor, who opened engineering offices at the first of the year as Greyrad Corporation. Our major product is high temperature probes for arc jet diagnostics, but wind tunnel models, rocket probes, and theoretical studies have also been keeping us very busy." . . . **Richard Bradt** finished his Ph.D. at R.P.I. and is presently Assistant Professor of Ceramics at Pennsylvania State University, State College, Pennsylvania. . . . **Bob Mullen** says: "I am still a Computer Systems Analyst for Collins Radio Company working now as Technical Staff to the Engineering and Scientific Programming Department. During the year we adopted Susan Kay. Brian is now 7 and Karen 4. I expect an M.B.A. from the University of Iowa in June. Recently was promoted to Captain in U.S.A.R." . . . **Dale Pesce**, his wife Anna and his children, Sandra (28 months) and Dominic (5 months), are living in Chicago. He is on the staff of Michael Reese Hospital as Biochemist in the Department of Medicine. He says he'd like to hear from classmates, especially those in the Chicago area.

From **Sheldon Epstein**: "I have just joined Booz-Allen Applied Research, Inc., as a Management Consultant. My wife Suzanne (Wellesley '62), who is **Sam Latt**'s sister, was awarded her Ph.D. in art history from Northwestern University. Our second child and first daughter, Elizabeth Anne, was born on October 8, 1967. On a recent trip to Wright-Patterson Air Force Base, I discovered two members of our class who are now M.D.'s and Air Force Captains: **Bob Gold** at Wright-Patterson A.F.B. and **Bill Baer** at Brooks A.F.B." . . . **William Hawkins** has moved from Covington, Va., to Wilmington, Del. He says he is "still working at the interface between electronics and the chemical industry for Hercules, Inc." . . . **Deena Koniver** reports that "after three years in beautiful Palo Alto, Calif., I have come east to work at the National Institutes of Health in Bethesda, Md. I am working for Jim Slagle doing basic research in computer heuristics." . . . Keep the news coming—**Linda G. Sprague**, 345 Brookline Street, Cambridge, Mass. 02139

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The new travel tax is going to hit quite a few members of the Class. Take **Al Brennecke** for example; he writes: "After 3½ years with Industrial Nucleonics in Columbus, Ohio, in the Industrial Division, I have been transferred to Brussels, Belgium, as Assistant Manager—International Division. We have now been here for about five months and like it immensely. The pace is a lot slower among the Belgians but the Americans keep up the fast-stepping.

Our 11-month son, Eric, seems to have adapted well. We may get some skiing in the Alps this winter." . . . Another sad example is **Manuel Moreno** who has been in Paris since January of last year. He is the Manager in Southwestern Europe for Cooper-Bessemer. He says: "I am primarily responsible for providing marketing, engineering and manufacturing support for our license. Before Paris there was London, where I was working for our U. K. subsidiary. . . . **Alfred Crisi** will escape the tax due to his military status. He is a Lieutenant Colonel (in the Army, I think) stationed in Wiesbaden. The Crisi adopted a little boy, now 3½, named Peter. They remain, tax free, in Europe until August. . . . **Avram Kalisky** just returned from Thailand. He was sent there by U.N.E.S.C.O. to organize the Instrument Repair and Calibration Center of the Applied Scientific Research Corporation of Thailand. He was there for 10 months and it seems to have been a success. Now that he is back he works for Avco's Missile Systems Division in Wilmington, Mass. He, his wife and three children live in Sudbury. . . . Also back from Thailand, but presumably from a different mission is Captain **Kenneth Singer**. He is now stationed at the Ent A.F.B. in Colorado. . . . **Fred Schmidt** married Eileen Gray Rohwedder last July 22 in Washington, D.C., from whence they left for Europe (tax free) on a honeymoon. He says: "As if a chemical engineer in the family wouldn't be enough, she has a B.A. in chemistry and biology from Murry State University, Class of '63.

Richard Howe writes: "After two years with the U.S. Public Health Service ('61-'63) and four years of teaching at Southern Illinois University ('63-'67), I have returned to the University of Wisconsin to work on a Ph.D. in urban and regional planning." . . . **Robert Rein** says: "It's been an eventful year. Finally finished a Ph.D. in engineering at University of Oklahoma. That's real injun country! Am now doing research for the O.U. Research Institute in Norman. Married a home-town girl, Virginia Nester of Grosse Point, in October. **Paul Cox** and **Eric Arens** were ushers. Honey-mooned in Antigua, W.I. (which is a great place, especially after living in injun country for 6 years). Now I'm back fighting off injuns and pulling for our football team." . . . Another member of the Ph.D. club is **Richard Gilardi**, who got his at University of Maryland in physical chemistry in 1966. Now he's employed by the Naval Research Laboratory in their Lab for the Structure of Matter. He is also the current recipient of the National Academy of Science—National Research Council Postdoctoral Research Associateship. Congratulations, Dick. . . . **Richard Williamson**, who of course has a Ph.D. (from M.I.T. in '66), is with the low temperature group at N.A.S.A., Cambridge. He also goes back across Vassar Street to the 'toot' to do research as a visiting scientist. His wife, Christi, teaches at a Natick school near their home. . . . **Donald Easson** says: "Gin and I have lived in Wilmington, Del.,

since graduation. I am working for Atlas Chemical Industries as a Scientific Computer Coordinator. We have two children, David and Keni, ages 6 and 3. We are enjoying our activities and the Wilmington area. **Charles Rivers** also works for Atlas and was recently named Project Leader in our Chemical Engineering Department."

Sharon and **Dan McConnell**, along with their two boys, are back in Boston (Needham actually). He was shifted around by Raytheon and now works for them in Waltham. . . . **Ru-Liand Wang** teaches at R.P.I. and is a Technical Consultant to the Watervliet Arsenal, Mrs. Wang consults in city planning for Albany, N.Y. . . . **Robert Weimer** left the Army in Washington, D.C., and moved north to Allentown, Pa., where he toils for Air Products and Chemical, Inc. . . . **John Castle** and **Alvin Martin** both work for Procter and Gamble. The latter in Cincinnati in the Industrial Chemicals Section. Alvin says that he travels extensively and is having a ball. John says he has three sons: Phil, 3½, Mike, 2½, and Dave, 1. In addition, they have 2/3 of a boxer dog per boy. . . . **George Harrison** is "struggling with a bad case of the flying bug." . . . Since last June **Leonard Spar** has been Director of Marketing for Arcon Corporation in Wakefield, Mass. . . . **Tom Lawford** is in his third year of medical school at University of Virginia. He spends his summers working for N.A.S.A. as an Electrical Engineer. . . . **Arrigo Mongini** is an Economist at the U.S. Department of Transportation. . . . **Don Staffin** visited Expo '67 last fall and says: "It was well worth the trip. Am now working for Bill Hadigian, '48, at State Mutual Life in Worcester, Mass." . . . Archie MacMillan, '59 is a Research Scientist at T.R.W. Systems in Redondo Beach, Calif. . . . Finally, it gladdens my heart to reopen the goof department. This time the goofing is by our one and only Alumni Office. To wit the note: "Mr. George M. Pearsall does not now live at 2941 Welcome Drive, Durham, N.C., as shown in your 1967 M.I.T. Alumni Register. This is about the fourth time we have received his mail and notified you of this. Please correct your records as this is an inconvenience to us." It was signed **George W. Pearsall**, 1961. I am looking forward to hearing more about the troubles of Mr. Pearsall; I'm quite sure they will not end here!—**Andrew Braun**, 131 Freeman Street, Brookline, Mass. 02146

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Dan L. Smythe, Jr., who received his Ph.D. in E. E. in January, 1967, is now Assistant Professor of Electrical Engineering at M.I.T. where he is running a new Microelectronics Laboratory. . . . Mr. and Mrs. **Daniel Smythe** have a daughter, Hebe Randolph, born May 10, 1967. . . . **Phil Hudock**, L.I.B., B.C. Law, L.L.M., Georgetown, was recently admitted to the Virginia Bar and Virginia Supreme Court of Appeals. He is also a member of the Washington, D.C., Bar,

and is associated with the Washington firm of Galland, Kharasch, Calkins and Lippman, specializing in transportation law. . . . **Thomas H. Gawronski**, who received a M.S. in food science from Washington State University in June, 1964, is now working towards a Ph.D. in molecular Biology which he expects to receive from Dartmouth College in June, 1968. Tom's wife Jane received her M.Ed. from the University of Idaho in June, 1964, and now teaches math at the secondary level. . . . J.J. Poli, '64, reports he spent two years at Harvard in the Administrative Career Program, was Director at the Center for Field Studies for a third year and received his Ed. D. degree in June, 1967. He is presently working in administration at a Ridgewood, N.J., school. The Poli's have two children, Cathy, 4, and Michael, 1.

Randall Kunz and wife report a second child born June 1, 1967, Caroline Willard Kunz. . . . **Emanuel C. Terezakis**, who received his Ph.D. in chemistry from Brown University in June, 1967, is now employed at Owens-Corning Fiberglass, Ashton, R.I. . . . **Alan W. Carlson** received a Ph.D. in E.E. from M.I.T. in June, 1967, and is now working for Bomac Division of Varian Associates. . . . **Sheldon J. Hoffman** is in his second year of M.B.A. program at Columbia Business School. . . . **Peter W. Hartman**, who is Assistant to President at Wiltek, Inc., Wilton, Conn., is also working part-time on his M.B.A. at the University of Bridgeport. The Hartmans are restoring an 18th Century home in Nichols. . . . Lt. **John A. Moulson** received a master of science in mechanical engineering from Naval Postgraduate School, Monterey, Calif., September, 1967. . . . **Herbert L. Selesnick**, who received a S.M. from Sloan School of Management in 1964 and also married the former Judith Ann Finkelstein in October, 1965, is now working as Management Consultant in Public Administration, Boston, Mass., while in the process of writing thesis for his Ph.D. in political science at M.I.T. . . . **Jeffrey Steinfeld** is presently Assistant Professor of Chemistry at M.I.T. . . . After spending spring semester 1967 at Rochester University as visiting Assistant Professor in the Political Science Department, **Steven J. Brams** is now Assistant Professor in the Political Science Department of Syracuse University. . . . **Robert A. Morris**, who has been in Chicago since grad school, recently left his Senior Analyst position with Caywood-Schiller Association to join Alden's, Inc., as Manager of Research. Bob, his wife, Ileen (B.U.'63), children Michael, 3½, and Karen, 1½, have also recently moved into a home in Deerfield, Ill.

The 1967 selection of scientist-astronauts by the National Aeronautics and Space Administration included William B. Lenoir, '61, Assistant Professor of Electrical Engineering. Dr. Lenoir has been a member of the Radio Astronomy Group of the M.I.T. Research Laboratory of Electronics and a Postdoctoral Engineering Fellow. He received the S.B. and S.M. degrees in electrical engineering from

M.I.T. simultaneously in 1962 and the doctor of philosophy degree in electrical engineering from the Institute in 1965. Professor Lenoir began his role as a scientist-astronaut in mid-September, 1967, when he reported to N.A.S.A.'s Manned Spacecraft Center at Houston, Texas, for six months of intensive astronaut training. That is being followed by a year of supersonic jet pilot flight training. It is anticipated that he will be involved primarily with the Apollo Applications Program, designed to make scientific use of the capabilities resulting from the Apollo Program. . . . **Edwin A. Carlson** has been named an Assistant Actuary in the Actuarial Division of the Casualty-Property Department at the Travelers Insurance Companies, Hartford, Conn. He joined the company as an actuarial student in 1963, was appointed Actuarial Analyst later that year, and promoted to Actuarial Assistant in 1964. . . . Digital Equipment Corporation, Maynard, Mass., announces the **John B. Cohen** has joined their company as a Systems Programmer. Cohen had been serving with the Arthur D. Little Company, Cambridge, and is married and has one son.

Army Major **Zach Hagedorn, Jr.**, began a 10-month regular course at the Army Command and General Staff College, Ft. Leavenworth, Kansas, August, 1967. On October 11, 1967, Major Hagedorn received the Bronze Star Medal for outstanding meritorious service in combat operations against hostile forces in Vietnam from July, 1966, to June, 1967. Major Hagedorn is among more than 1,200 officers from the U.S. and 51 allied nations who are preparing for duty as commanders and general staff officers in division or logistical commands. Major Hagedorn received a bachelor of science degree in 1955 from the U.S. Military Academy at West Point, N.Y., and a master of science degree in civil engineering and in mechanical engineering in 1962 from M.I.T. He and his wife, Audrey, live in Leavenworth, Kansas. . . . **Wells Whitney**, who received his Sc.D. degree in materials science from M.I.T. in 1964 and graduated from Harvard University with an A.B. in chemistry, has been appointed a Research Associate by Celanese Research Company, Summit, N.J. Dr. Whitney will conduct and direct research in polymer physical structure. Dr. Whitney and his wife live in Summit, N. J.—**Gerald L. Katell**, Secretary, 310 Hoge Building, Seattle, Wash. 98104

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5th Reunion; Harborside, Edgartown; June 7-10, 1968; for reservations: Peter T. Van Aken, 7 Hickory Lane, Belmont, Mass.

Apparently the shortened columns of late have caused classmates to take pity on me. Although I haven't exactly been deluged with mail, several kind souls have taken the time to write me. . . . **Floyd Stecker** writes that he finished his A.M. in astronomy from Harvard in

'65, and recently finished his Ph.D. with a thesis on gamma ray production interstellar and intergalactic cosmic ray collisions. While a grad student, he worked for the Smithsonian Astrophysical Observatory. Now he is with the N.A.S.A. Goddard Center in Greenbelt, Md. . . . **Robert Ratonyi** writes that he changed jobs last October and is now with the Gilbert and Barker Manufacturing Company, Greensboro, N.C., as an Investment Analyst. Before moving to N.C., he finished the Engineering Management Program at Drexel in Philadelphia. . . . **Paul Milne** is now working as an Acoustics Engineer with the C.B.S. Labs in Stamford, Conn. He and his wife have a son, Joshua, who is now almost a year old. . . . **Ron Englade** is working on his Ph.D. at the University of Chicago. He was married last July. . . . **Glen Books** graduated from Columbia Law in June, 1966, and is now a Patent Attorney at Bell Labs. He also coaches the debate team at Mt. St. Vincent College in New York, and is pleased to announce that his girls recently beat the M.I.T. team. (Our engineers probably had trouble keeping their minds on the proper topic.) . . . **Theodore Cohn** has received an M.S. in bioengineering, an M.A. in math, and is currently working on his Ph.D. . . . **Peter Cleveland** won his Ph.D. last August from Iowa State. He is now working for the Wisconsin Alumni Foundation and has joined the American Alpine Club. . . . **Malcolm Beaverstock** is working on his Ph.D. in chemical engineering at Cornell. He plans to work for Uniroyal in Naugatuck, Conn. . . . **Mark Lawner** is now Director of Planning for General Planning and Resource Consultants in St. Louis. . . . **Ben Saievetz** is now working for T.W.A. in long-range planning.

John Addis wrote an interesting letter awhile back about his travels in Western and Eastern Europe. While in Kiev he decided to take the Intourist guide up on his statement that Western newspapers were readily available in the U.S.S.R. He set out, knowing only three words in Russian, to find the N.Y. Times. He ended up in a university-affiliated library asking to see a Western, non-communist newspaper. The librarian couldn't understand him and finally led him into a plush office where she introduced him to the head of the library. This gentlemen explained to him that there were libraries devoted to social sciences which did have subscriptions to *Newsweek*, *U. S. News and World Report*; and *Time*, but that his library was devoted to the pure sciences. He then offered to show John the foreign magazines that he did have. They went to the sorting room and right there on top of the heap was the *Technology Review*. Gets around, doesn't it? In all, John found the Soviet people to be much more friendly than many in the Western European countries. Could be they haven't seen as much of the "Ugly American" as yet. So much for this month. If you have any news, send it to—**Bob Johnson**, Secretary, 209 East 66th Street, New York, N. Y. 10021.

Course Review

V

The following completed requirements for the doctorate during the first term, 1967-1968, and were awarded degrees in February. . . . In Analytical Chemistry: **David N. Bailey**, B.S. 1963, Juniata College, entered M.I.T. with a National Science Foundation Fellowship which he held from June, 1963, to June, 1966, and also held a National Institutes of Health Fellowship from September, 1967, through January, 1968. He has joined the staff of Gustavus Adolphus College, St. Peter, Minn., as an Assistant Professor. . . . **Wayne R. Matson** entered M.I.T. from Andover Academy. He was awarded the S.B. degree in chemistry (Class of 1964) and completed his requirements as a National Institutes of Health Fellow which he held for two years. He has joined the staff of the University of Michigan at Ann Arbor where he will devote his full time to research, working with Professor **John Winchester**, Ph.D.'55, formerly professor of Geology and Geophysics at M.I.T. (1956-1963).

In Inorganic Chemistry: **Kirk V. Darragh**, B.S. 1964, University of Cincinnati, was awarded a National Institutes of Health Fellowship for the entire period of his graduate study. Kirk has entered industry.

In Organic Chemistry: **Charles P. Casey**, B.S. 1963, St. Louis University, entered M.I.T. in September, 1963, as a National Science Foundation Fellow a position which he held through September, 1967. Mr. Casey is working with Professor Paul Bartlett of Harvard University under a postdoctoral N.S.F. Fellowship. . . . **Miss Shen-Wei Chien**, B.S. 1964, the National Taiwan University, Taiwan, China, completed her requirements in November. She will remain at M.I.T. under an appointment as a Research Associate working with Professor Kemp, her thesis supervisor, on problems related to the synthesis of peptides. . . . **Robert Damrauer**, B.S. 1963, University of Michigan, has been awarded a National Science Foundation Postdoctoral Fellowship and will work with Dr. Paul Bartlett at Harvard University. . . . **John R. Grunwell**, B.S., 1963, Uni-

versity of Pennsylvania, has accepted an assistant professorship at Miami University, Oxford, Ohio. In case you are interested, the title of his research was "The Syntheses of Dithiocarbamate Esters and cis-1-2-Cyclo-Alkanedithiols and the Photolyses of Enethiol Esters." Professor Glenn Berchtold was his supervisor. . . . **Peter Kulsa**, B.A. 1963, Northeastern University, Boston, is with the Synthetic Research Division of Merck, Sharpe and Dohme, Rahway, New Jersey. Peter spent five years under the Northeastern Co-operative Plan and gained a very valuable experience in research prior to admission to M.I.T.

Edward J. Panek, B.S. 1963, University of Wisconsin, has accepted a postdoctoral fellowship at Iowa State University, Ames, Iowa, where he will devote his full time to research. He will be associated with Professor G. A. Russell. From June, 1965, to June, 1966, Dr. Panek held the E. B. Hershberg Fellowship established by the Schering Corporation, Bloomfield, N.J., "as a testimonial in recognition of his many and diversified talents, his capacity as a human being, and the catholicity of his intellect and interests." Dr. Hershberg received the S.B. in chemical engineering in 1929 and his doctorate in organic chemistry in 1932. . . . **Stephen S. Washburne**, B.S. 1963, Trinity College, Hartford, Conn., has accepted an assistant professorship at Temple University, Philadelphia. He held a two-year National Science Foundation Fellowship and the Union Carbide Corporation Fellowship as a candidate for the doctorate.

In Physical Chemistry: **David O. Ham**, B.S. 1961, University of California at Berkeley; S.M. 1964, M.I.T., has a postdoctoral appointment at the University of Pittsburgh.

This brings to 1,055 the number of degrees of doctor of philosophy and doctors of science awarded in the various fields of chemistry. Postdoctoral appointments are, in general, temporary, with permanent appointment in teaching and in industry. The trend is toward higher education.—**Leicester F. Hamilton**, Correspondent, M.I.T. 4-254, Cambridge, Mass. 02139

VI

Prize paper awards to **Jonny Andersen**, S.M.'62, Ph.D.'65; **Harry B. Lee, Jr.**, S.M.'59, Ph.D.'62; and **Michael L. Dertouzos**, Ph.D.'64, have been announced by I.E.E.E., and will be presented at the Directors' reception during the New York International Convention in March. The W.R.G. Baker Award for the best paper published in any of the *I.E.E.E. Transactions* was won by the joint Andersen-Lee paper entitled "Network Synthesis Using Lossy Reactances." Dr. Andersen resigned his Assistant Professorship at M.I.T. last June to join the faculty of the University of Washington in Seattle. Dr. Lee joined Lincoln Laboratory last May. While an Assistant Professor at M.I.T. he taught the graduate courses in network synthesis and in 1962-63 lectured in this field as a Fulbright scholar in Denmark. Last year he developed, with Professor Richard D. Thornton, S.M.'54, Sc.D.'57, a new graduate course in active linear and nonlinear networks. Dr. Dertouzos received the Browder J. Thompson Memorial Prize Award for the best paper in any I.E.E.E. publication by authors under 30 years of age. It was entitled "PHASE-PLOT: An On-Line Graphical Display Technique." Dr. Dertouzos is Assistant Professor at M.I.T. and is active in computer research and in the development of some of the computer oriented subjects of instruction.

Arlliss E. Whiteside, S.M. and E.E.'57, has been promoted to Assistant Department Head, Image Data Systems Department at Bendix Research Laboratories, Southfield, Mich. His undergraduate work was done at Purdue University where he qualified for a National Science Foundation Fellowship for graduate study at M.I.T. . . . **David J. Sakrison**, Sc.D.'61, Assistant Professor at M.I.T. 1961-63, is now Associate Professor of Electrical Engineering at the University of California, Berkeley, and Consultant for the Ampex Corporation, Redwood City, Calif. His research interests are in information processing and his recent publications are in the fields of information theory, communication theory and automatic control.

Stephen H. Unger, S.M.'53, Sc.D.'57, and **Omar Wing**, S.M.'52, are Associate Professors of Electrical Engineering at Columbia University and are members of the staff which administers the computer science program. . . . **Amiya K. Sen**, S.M.'58, is also an Associate Professor of Electrical Engineering and a member of the Columbia Plasma Physics Committee which directs the interdepartmental program in plasma physics.

Hans S. Witsenhausen, S.M.'64, Ph.D.'66, is a staff member in the mathematics group of Bell Telephone Laboratories, Murray Hill, N.J. A paper entitled "A Minimax Control Problem for Sampled Linear Systems," in the February *I.E.E.E. Transactions on Automatic Control*, is an extension of his doctoral thesis carried out under the supervision of Professor Michael Athans. Dr. Witsenhausen is organizer and Session Chairman of an invited session entitled "Minimax Problems in Control" at the 1968 joint Automatic Control Conference in Ann Arbor, Mich. Born in Frankfurt am Main in Germany, he received his higher education in Belgium and is now a citizen of the United States. He was awarded a Hertz fellowship while a doctoral student at M.I.T. . . .

Mostafa E. Talaat, '50, working with a team of scientists at the University of Maryland, appears to be on the track of a new energy source for human-heart pacemakers. Trials on animals have shown that electrodes inserted in the heart and bloodstream can supply the necessary energy. The operating principle is not yet understood but seems more like fuel cell action than ordinary battery action. In 1964 Dr. Talaat became Professor of Energy Conversion in Mechanical Engineering at the University of Maryland, where he directs research programs in magnetoplasma dynamic, thermionic and biomedical energy conversion. He is writing a book on direct energy conversion. His Ph.D. degree in electrical engineering was conferred by the University of Pennsylvania.

Nicholas DeClaris, S.M.'54, Sc.D.'59, a member of the Electrical Engineering Faculty of Cornell University for several years, greeted the New Year at the University of Maryland where he took up his new duties as Head of the Electrical Engineering Department and as Research Professor at the Institute for Fluid Dynamics and Applied Mathematics. . . . **Benjamin J. Leon**, S.M.'57, Sc.D.'59, Professor of Electrical Engineering at Purdue University, has been made Significant New Activity Editor, *I.E.E.E. Transactions on Circuit Theory*. At the National Electronics Conference in Chicago in October, 1967, he presided over a session on Computer Aided Circuit Analysis and Design. . . . Major **Richard E. Fitts**, S.M.'55, Ph.D.'66, has joined the teaching staff at the United States Air Force Academy in Colorado following service at Da Nang Air Base in Viet Nam.—**Karl L. Wildes**, Correspondent, Room 4-232, M.I.T., Cambridge, Mass. 02139

XIII-A

Alumni of the Naval Construction and Engineering Program were saddened to learn of the death of Captain **John D. Working**, U.S.N., Nav. E.'50. John died of injuries sustained in an automobile collision just before Christmas. At the time, John was Officer in Charge of the Naval Ship Engineering Center, Philadelphia. His services and inspirational leadership will be missed. . . . Captain **Wayne Hoof**, U.S.N., M.S.'48, recently retired from the Navy after 26 years of service as an Engineering Duty Officer. Among the more interesting assignments in Wayne's long career were his most recent positions as Head of the Engineering Department and the English, History and Government Department at the U.S. Naval Academy. Wayne and Mary plan to settle in Annapolis. . . . Commander **Robert W. Witter**, U.S.C.G., Nav.E.'58, is currently Commanding Officer of the U.S. Coast Guard Field Testing and Development Center, Curtis Bay, Md. Bob recently was author of a paper on "Rescue Boat Development" in the *Naval Engineer's Journal*. Since leaving M.I.T., Bob has been in the Boat Section, Naval Engineering Division at Coast Guard Headquarters and had an interesting assignment in 1963 as Delegate to the International Lifeboat Conference at Edinburgh, Scotland.

Commander **E. M. Avallone**, U.S.N., Nav.E.'60, is currently serving as Placement Officer in the Officer Distribution Division of the Bureau of Naval Personnel. Prior to this assignment Gene taught thermodynamics and fluid mechanics at the U. S. Naval Academy. Gene's interesting article on "L.D.O. Phase Down—Right or Wrong" in a recent *Naval Engineer's Journal* discusses problems associated with meeting personnel requirements of specialist billets in the Navy. . . . Commander **Edwin L. Parker**, U.S.C.G., Nav.E.'61, visited M.I.T. in conjunction with design projects for the XIII-A graduating class. Ed is now on the Technical Staff of the Program Management Office for the National Data Buoy System. The Data Buoy System is being studied as a means of gathering meteorological and oceanographic data over major portions of the ocean surface. . . . Commander **James E. Kaune**, U.S.N., Nav.E.'55, visited the Boston area recently in connection with this new position as Design Superintendent, Philadelphia Naval Shipyard. Jim was co-author of a paper "Experience Concerning 1200 psi Naval Steam Generators" presented at the March 8 meeting of the New England Section, the Society of Naval Architects and Marine Engineers. The paper was prepared while Jim was the Assistant for Fleet Maintenance at the Naval Ship Engineering Center, Philadelphia (formerly N.B.T.L.). . . . Rear Admiral **William C. Hushing**, U.S.N., S.M.'44, Commander, Portsmouth Naval Shipyard, presented a paper at the last annual joint meeting of the Engineer-

ing Manpower Commission of Engineers Joint Council and the Scientific Manpower Commission. The paper was entitled "The Impact of High Performance Science and Technology on Manpower Requirements at the Undersea Interface" and dealt with the tremendous problem man faces in exploiting the oceans. . . . Rear Admiral **William A. Brockett**, U.S.N. (Ret), S.M.'43, was another speaker at the same meeting. Currently President of Webb Institute of Naval Architecture, Bill spoke on "An Undergraduate Window to Industry," a description of the curriculum at Webb with particular emphasis on the winter practical work period. . . . Captain **Norbert Frankenberger**, U.S.N., S.M.'45, has been selected for promotion to Rear Admiral, U.S.N. Since 1965 he has been assigned as fleet maintenance officer, Staff of the Commander Service Force, U.S. Pacific Fleet. . . . Purdue University has announced that Professor **Clifford Gerde**, S.M.'44, has been appointed Head of the Department of Freshman Engineering. Cliff, Professor of Mechanical Engineering on the Purdue Calumet Campus, is Assistant Dean for Academic Affairs there as well as a faculty representative on the Purdue-Indiana University Coordinating Board for regional campuses in Indiana. . . . Captain **Charles N. Payne**, U.S.N., S.M.'48, has been awarded the Naval Legion of Merit Award for his exceptionally meritorious service as Comptroller, Naval Ship Systems Command, from September 1963 to August 1967. During this period Charlie played a dominant and positive role in providing for the funding of Southeast Asia requirements for ship and craft procurement, maintenance, and operations. . . . Commander **Roderick M. White**, U.S.C.G., Sc.D.'65, was author of a recent paper entitled "Icebreaker Model Tests" published in the *Naval Engineers Journal*. Commander White is a member of the permanent commissioned teaching staff at the U. S. Coast Guard Academy. He is currently serving as Chief of the Applied Science Section at the Coast Guard Academy. Commander White has made four extended ice cruises, served as engineering officer on the U.S.C.G. Icebreaker, *Westwind*, and is currently involved in the icebreaker design effort underway at Coast Guard Headquarters. . . . A recent note from Captain **Richard J. Dzikowski**, U.S.N., Nav.E.'50, reports that he is currently Assistant Program Manager for Deep Submergence Vehicles in the Naval Ship Systems Command and a member of the American Bureau of Shipping, Special Committee for Deep Submergence Vehicles.—**Robert E. Stark**, Correspondent, M.I.T. 5-317, Cambridge, Mass. 02139

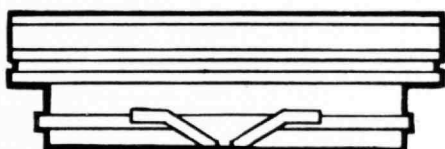


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